SOIL SURVEY OF

Hawkins and Hancock Counties, Tennessee

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Tennessee Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1966-72. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the counties in 1972. This survey was made cooperatively by the Soil Conservation Service and the Tennessee Agricultural Experiment Station. It is part of the technical assistance furnished to the Hawkins County and Hancock County Soil Conservation Districts.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, woodlands, and wildlife areas; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Hawkins and Hancock Counties are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the woodland groups and wildlife.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Wildlife managers and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings in the section "Engineering Uses of the Soils."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain estimates of soil properties and information about soil features that affect engineering practices.

Scientists and others can read about the soils in the section "Formation and Classification of the Soils."

Newcomers in Hawkins and Hancock Counties will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They will also be interested in the information about the counties given at the beginning of the publication and in the section "General Nature of the Area."

Cover: Typical pattern of soils on many farms in Hawkins and Hancock Counties. The hilly soils are used for pasture, the steep soils for woodland, and the level to undulating soils for grain, tobacco, and hay.

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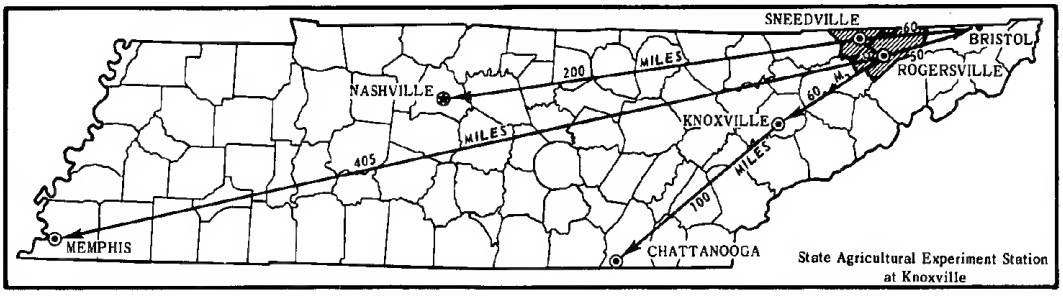

***Figure 1.*—Location of Hawkins and Hancock Counties in Tennessee.**

SOIL SURVEY OF HAWKINS AND HANCOCK COUNTIES, TENNESSEE

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TENNESSEE AGRICULTURAL EXPERIMENT STATION

HAWKINS AND HANCOCK COUNTIES, in northeastern Tennessee (fig. 1), have a total area of 710 square miles, or 454,400 acres. Virginia forms the northern boundary of these counties.

Hawkins County has an area of 307,200 acres, or 480 square miles. Hancock County has an area of 147,200 acres, or 230 square miles. Rogersville is the county seat of Hawkins County. It is near the Holston River, about 25 miles southwest of Kingsport and 65 miles northeast of Knoxville. Sneedville is the county seat of Hancock County. It is near the Clinch River, about 15 miles northwest of Rogersville.

All of the survey area is in the Ridge and Valley province of the Southern Appalachians. The local part of this province is known as the Great Valley of East Tennessee. It is characterized by many linear, nearly parallel ridges and intervening valleys that extend northeast-southwest. The more prominent of these ridges include Clinch Mountain, Powell Mountain, Wallens Ridge, and Bays Mountain. The highest elevation is 3,118 feet atop Chimneytop Mountain. The lowest elevation is about 1,040 feet, at Cherokee Reservoir.

The higher ridges are capped with relatively resistant, steeply dipping sandstone and siltstone, which weathered slowly to produce unfertile, moderately deep, predominantly steep soils. The soils in the valleys are underlain mostly by shale. These soils are generally of limited depth, permeability, and productivity.

Bands of limestone occur at intervals. They weathered more rapidly than the adjacent materials, producing broad valleys of deep, clayey, more highly productive soils. Areas of dolomitic limestone are characterized by moderately high ridges and hills. These soils are deep, are somewhat cherty, and have a reddish clayey subsoil.

The survey area is drained by the Powell, Clinch, and Holston Rivers and their many tributaries. Of these three rivers, only the Holston has extensive bottom lands and terraces adjacent to it. These gently sloping terraces provide sites for most of the major industries in Hawkins County.

Most of the transportation and communication lines follow the northeast-southwest trend of the valleys. There are some winding roads across the ridges in low gaps.

Native vegetation was chiefly hardwood forest and scattered stands of pine and cedar. Extensive canebrakes grew on bottom lands of some creeks. Most of the steeper ridgeland is still wooded, although overcutting, grazing, and fires have reduced the stand quality in many tracts.

General Nature of the Area

This section briefly describes the development of Hawkins and Hancock Counties and gives facts about the population and the main sources of income. It also describes the climate of the area and gives information about farming. The farming statistics are from records of the U.S. Bureau of the Census.

Hawkins County was created by the Legislature of North Carolina in 1787. It was named in honor of Benjamin Hawkins, a member of the Continental Congress and U.S. Senator. The original boundaries of the county extended to present day Chattanooga and westward to what is now Davidson County. The county was greatly reduced in size between 1792 and 1870 as other counties were established within the original boundary.

Hancock County was created by the Tennessee Legislature in 1844. It was named in honor of John Hancock.

Early settlers in the area came from Pennsylvania, Maryland, Virginia, and North Carolina. They were proficient hunters, farmers, and craftsmen. The principal cash crop has long been burley tobacco, raised on small farms together with beef and dairy cattle. Rogersville is a leading market center for burley tobacco.

In 1970 Hawkins County had a population of 33,726. Of this, 15,716 were rural nonfarm residents and 9,918 were urban residents. Of 10,822 workers, 5,476 worked in the county and 4,613 outside the county; 715 did not report their place of work. The 2,719 farms average 79.3 acres.

In 1970 Hancock County had a population of 6,719, entirely rural. Of 1,566 workers, 853 worked in the county and 441 outside the county; 272 did not list their place of work. The 1,263 farms in Hancock County have an average size of 82 acres.

Important industries within the survey area are located mainly along the Holston River near U.S. Highway 11 W. These include manufacturers of books, plate glass, automobile parts, textiles, cards and labels, ammunition, plastic housewares, furniture, and electric motors. Other employers include a TVA steam plant and motor freight terminals. Most area residents working outside their home counties are employed by industries in nearby Kingsport, Bean Station, and Morristown.

The survey area has the potential for production of specialty crops such as vegetables, fruits, nuts, and nursery products. Only such high value crops as can be grown on small plots of suitable soils can become economically important in areas that have such a rugged landscape and diversified ownership. Livestock production, particularly of feeder calves, is likely to remain important, as is tobacco production.

Probably the present trend of industrialization and growth of suburban areas will continue, and many of the steeper and less productive tracts of cropland and pasture will revert to forest. Other tracts that are now nearly idle may be used as improved pasture. The recreational and scenic potential of the area will become increasingly important. Some combination of forest management and natural recreational use may be feasible.

Because of the continuing demand for additional land for homesites, roads, and industries, comprehensive planning of urban growth is needed. Areas that have few limitations for residential sites are commonly the most productive for farming. There are few areas that have only slight limitations for most uses, so long-term priorities should be established before irreversible land use decisions are made.

Knowledge of the limitations of other soils allows developers to safely design around those limitations. For instance, esthetically pleasing and environmentally sound residential developments could be safely planned and built on shale-derived soils if adequate central sewage treatment plants were installed, rather than if septic tank disposal systems were used in soils unsuitable for them.

Climate [1]

The survey area is characterized by mild winters, warm summers, and abundant annual rainfall. The climate is mainly influenced by warm, moist airmasses moving northward from the Gulf of Mexico and by cool, dry, continental airmasses from regions to the north and west of the State. Frequent displacement of one of these airmasses by the other in winter and early in spring, and less frequent displacement during the other seasons, provides invigorating changes in the weather.

Tables 1 and 2 give climatic data from records kept at Rogersville. Although local topographic features appear to have only minor effects on major climatic elements, Rogersville data are not applicable to the surrounding terrain without making allowances for the influence of hills and ridges on precipitation, wind, cold air drainage, snowfall, and other climatic features.

Precipitation is generally well distributed throughout the year. It is heavier in winter and in spring because of frequent flows of moist air from the south. A secondary seasonal maximum of precipitation occurs late in spring and early in summer in the form of local showers and thunderstorms. Precipitation is generally lightest late in summer and early in fall. Thus, while there are periods of dry weather, there are also periods of plentiful rainfall in all seasons. Annual total rainfall during the period of record at Rogersville ranged from 29.3 inches in 1941 to 53.0 inches in 1948 and 1962.

The average annual temperature at Rogersville is 58° F. From 1931 to 1970 temperature ranged from a maximum of 104° to a minimum of −19°. The range of temperatures on record for Rogersville is less than that for many places in the western part of the State. The number of days in which temperatures reached 90° or higher has ranged from 1 in 1963 to 81 in 1936. Occasionally, temperatures exceed 90° as early as April and as late as October, but the greatest frequency of high temperatures generally is in July and August. Although two-thirds of the days in winter have temperatures of 32° or lower, only about 1 day has temperatures of 0° or lower.

[1] By JOHN VAIKSNORAS, climatologist for Tennessee, National Weather Service, U.S. Department of Commerce.

TABLE 1.—*Temperature and precipitation data*

[Data from Rogersville, Hawkins County, 1931-70; elevation 1,355 feet; 36°25'N., 82°59'W.]

Month	Temperature			Precipitation				
	Average daily maximum	Average daily minimum	Daily average	Average monthly total	One year in 10 will have—		Days with snow cover	Average depth of snow on days with snow cover
					Less than—	More than—		
	°F	°F	°F	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	49	28	39	4.3	2.2	7.8	2.1	1.0
February	52	29	41	4.3	2.4	7.6	1.5	1.2
March	60	35	48	4.6	3.1	7.8	.6	.5
April	71	44	58	3.9	2.4	5.9	(1)	(2)
May	79	53	66	3.4	2.1	5.4	---	---
June	86	60	73	3.3	2.2	5.6	---	---
July	88	64	76	4.8	3.3	7.5	---	---
August	87	63	75	3.6	2.4	5.9	---	---
September	84	57	71	2.7	1.4	4.7	---	---
October	73	45	59	2.3	.7	5.1	---	---
November	60	35	48	3.1	1.4	5.7	(1)	(2)
December	50	29	40	4.0	1.9	7.1	1.3	1.1
Year	70	45	58	44.3	36.9	48.6	6.1	3.5

[1] Less than 0.5 day. [2] Trace.

TABLE 2.—*Probabilities of last freezing temperatures in spring and first in fall*

[Rogersville, Hawkins County]

Probability	Dates for given probability and temperature				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than	March 18	March 24	April 2	April 20	April 30
2 years in 10 later than	March 6	March 14	March 24	April 10	April 24
5 years in 10 later than	February 21	March 2	March 14	March 30	April 17
Fall:					
1 year in 10 earlier than	November 23	November 16	November 3	October 21	October 8
2 years in 10 earlier than	November 30	November 22	November 10	October 27	October 16
5 years in 10 earlier than	December 8	November 29	November 18	November 3	October 24

The number of days in which maximum temperatures fail to rise above freezing has ranged from 0 in 1949 to 16 in 1958. Table 2 indicates the dates of the last freezing temperatures in spring and the first in fall at Rogersville. They average, respectively, April 17 and October 24, giving a growing season of about 190 days. Elsewhere in the State, the average number of days having freezing temperatures differs from that in the immediate area of Rogersville by about a week in both the cooler northeast and the warmer southwest.

Severe storms are rare. Only three tornadoes have been reported in the two-county area. The area is too far inland to be subject to much damage from tropical storms. Hailstorms in a given locality average about two a year, commonly in spring. Heavy snowstorms are infrequent, and snow in winter seldom remains on the ground for more than a few days.

Relative humidity throughout the day usually varies inversely with the temperature, and it is therefore highest early in the morning and lowest late in the afternoon. Also, there is an annual variation of relative humidity. Average daily values are higher in winter and lower in spring.

The prevailing wind direction for each month of the year is west-southwest, and the average windspeed is about 6 miles per hour. The wind direction changes frequently and is from the west-southwest only about 15 percent of the time. The average monthly windspeed ranges from about 4 miles per hour in July, August, and September to about 8 miles per hour in March. Winds are usually lighter early in the morning and stronger early in the afternoon.

Clouds cover three-fifths of the sky, on the average, between sunrise and sunset. Average cloud cover varies annually from about seven-tenths from December through March to about one-half in September and October. There is less cloud cover during the growing season.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Hawkins and Hancock Counties, where they are located, and how they can be used. The soil scientists went into the survey area knowing they would likely find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (*6*).[2]

Soils that have profiles almost alike make up a soil series. Except for different textures in the surface layer, all of the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Dandridge and Dunmore, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Dunmore silt loam, 5 to 12 percent slopes, is one of several phases within the Dunmore series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called units. On most maps detailed enough to be useful in planning the man-

[2] Italic numbers in parentheses refer to Literature Cited, p. 8.

agement of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series or of different phases within one series. A soil complex is one such kind of mapping unit shown on the soil map of Hawkins and Hancock Counties.

A soil complex consists of areas of two or more soils so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Montevallo-Talbott complex, 20 to 45 percent slopes, is an example.

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, mapped, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that is readily useful to different groups of readers, among them farmers, managers of woodlands, engineers, community planners, and homeowners.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; they then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this publication shows, in color, the soil associations in Hawkins and Hancock Counties. A soil association is a landscape that has a distinctive pattern of soils. It generally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in locating sites for engineering works and recreational facilities and for town and country developments. It is not suitable for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, texture, stoniness, drainage, and other characteristics that affect their management.

The 14 soil associations in Hawkins and Hancock Counties are described in the following pages. They are grouped according to the nature of the material in which the dominant soils formed. For more information about the individual soils in each association, refer to the detailed map and to the section "Descriptions of the Soils."

Undulating to Steep Soils Underlain by Dolomitic Limestone

Three associations are in this group. The soils are dominantly on rounded, highly irregular hills and ridges. They are more than 5 feet deep over dolomitic limestone bedrock, and most have a reddish, clayey subsoil. Some of the soils are cherty, and some are nearly free of chert. The topography is dominantly hilly, but it ranges from undulating to steep.

1. *Fullerton-Claiborne-Clarksville association*

Hilly and steep, dominantly cherty soils more than 6 feet deep over dolomitic limestone; on high hills and ridges

This association consists of high, massive, scenic hills and ridges. A few water gaps and wind gaps break the otherwise linear, uniform ridges. In a few places the surface is deeply pitted by limestone sinks. The hillsides are exceptionally long and smooth, especially where slopes face east and north. A typical pattern is pale-colored cherty soils on the somewhat benched and dissected south- and west-facing slopes and dark-brown loamy soils on the longer and smoother east- and north-facing slopes. Along the base of some of the steep slopes, streams have cut to the limestone, which is exposed. Most of this association is drained by the small crooked and meandering drainageways leading to the valleys at either side of the ridges, but some areas are drained by limestone sinks and thus lack surface streams.

This association makes up about 10 percent of the survey area. It is about 40 percent Fullerton soils, 25 percent Claiborne soils, and 20 percent Clarksville soils. The remaining 15 percent is minor soils.

Fullerton soils generally are on the south-facing slopes and on ridgetops. They are deep and cherty and have a reddish, clayey subsoil. Claiborne soils are mostly on east- and north-facing slopes. They have a surface layer of dark-brown silt loam, a reddish, loamy subsoil, and very few chert fragments. The cherty, pale-colored Clarksville soils are mostly on west-facing slopes and on ridgetops.

Minor soils in this association are well-drained, loamy Minvale soils on benches and foot slopes, well-drained, loamy Greendale soils along narrow drainageways and in saucer-shaped depressions, and well-drained Sullivan soils and moderately well drained Hamblen soils on bottom lands.

About 70 percent of the acreage has been cleared. The rough and steep areas are generally in mixed hardwoods. Claiborne soils produce fine volunteer stands of yellow-poplar. Mixed stands of oaks, beech, gum, hickory, and maple grow somewhat slowly on Fullerton soils and on relatively dry Clarksville soils. Most of the cleared areas on hillsides are used for pasture, and fine pastures are throughout the association. Small patches of tobacco, corn, and garden crops are grown in the hollows, on hilltops, and on a few less steep hillsides.

Farms in this association average about 90 acres. Rais-

ing beef cattle is the main type of farming. Tobacco is the main cash crop. The potential for pasture and beef cattle farming, supplemented by a small acreage of such cash crops as tobacco, is high.

About three-fourths of the acreage is suitable for pasture, but steepness of slope is a limitation to use of farming machinery. Nearly one-fourth of the acreage is steep and rough and is suited to woodland, recreational facilities, and wildlife habitat. Small areas on hilltops, on benches and foot slopes, and in hollows are suitable for cultivation.

Slope is the main limitation in engineering works. Deep cuts are required for highway construction, but the soil mantle is very thick, and little cutting in rock is required. The cherty soils in the association provide good fill material. Inasmuch as some areas of this association lack flowing water, ponds are a common source of water for livestock. The soils are permeable, and chemical treatment or compaction is generally required before the reservoirs will hold water.

2. *Dunmore-Dewey association*

Rolling and hilly soils more than 6 feet deep over dolomitic limestone; on rounded hills

This association consists of relatively low, rounded hills. Approximately 85 percent of the association is on uplands; the rest is in small, smooth, scattered areas on benches, foot slopes, and bottom lands. In many places limestone sinks and shallow depressions are common. In a few places there are enough sinks to make the topography rough and irregular. Much of the drainage water empties into these sinks, and there are a few permanent streams. The few streams that do exist are fed by large springs. Small patches of dolomitic limestone bedrock can be seen around some of the deeper sinks and at the base of a few steeper slopes; in other places the soils are many feet deep over bedrock.

This association makes up about 15 percent of the survey area, and practically all of it is in Hawkins County. It is about 50 percent Dunmore soils and nearly 10 percent Dewey soils. The remaining 40 percent is minor soils.

The main soils in this association formed in place from the weathering of dolomitic limestone. Dunmore soils have a brown loamy surface layer a few inches thick and a red or yellowish-red clayey subsoil many feet thick. Dewey soils are similar to Dunmore soils, but the surface layer is darker. In cultivated fields the surface is mottled brown and red because erosion has exposed the reddish subsoil in spots.

Minor soils are well-drained, loamy Minvale soils on benches and foot slopes; well-drained, loamy Greendale soils along narrow drainageways and in saucer-shaped depressions; and dark-brown, loamy Claiborne soils on a few long, east-facing slopes. A few tracts of moderately well drained Hamblen soils are along the larger streams.

Except for small scattered farm woodlots, the acreage of this association has been cleared. It is densely populated and, in the eastern part of Hawkins County, contains numerous housing developments.

In this association farms average about 70 acres. Raising beef cattle is the main type of farming. Tobacco is the main cash crop; it is grown on nearly all farms. Pasture and hay are the main crops. Small fields of corn, silage, and small grain are on some farms. The potential for pasture and hay is high; nearly all of the acreage is well suited to these crops. The soils are very productive of such pasture and hay crops as alfalfa, orchardgrass, white clover, and tall fescue. Soils suitable for row crops are in small, irregularly shaped fields on hilltops, foot slopes, and the less sloping hillsides.

Slope is the main limitation to engineering works as well as to farming. The clayey texture is also a limitation, but probably less so than slope. Deep cuts are required in highway construction. Only in a few places is cutting in limestone rock required, because the soil is thick over bedrock. For housing developments, septic tank drainage fields are marginally successful.

3. *Decatur-Dewey association*

Undulating to hilly soils more than 6 feet deep over dolomitic limestone; on rounded hills

This association is on low-lying, gently rolling and rolling hills separated by short, crooked drainageways. Many of the drainageways empty into limestone sinks, which are fairly common throughout the association. All of the association is in Hawkins County.

This association makes up only about 1 percent of the survey area. Though small, it is important because the soils are productive and slopes are generally favorable. It is about 50 percent Decatur soils and 20 percent Dewey soils. The remaining 30 percent is minor soils, mostly Etowah and Emory soils and a few areas of Hamblen soils.

Decatur and Dewey soils are on most of the uplands. Both are well drained and have a reddish clayey subsoil. Depth to rock is great. The two soils are similar, but Dewey soils are less red than Decatur soils.

Minor soils are mostly well drained, loamy, and productive. Etowah soils are on foot slopes and on benches in the uplands, and Emory soils are in saucer-shaped depressions and along narrow drainageways. Moderately well drained Hamblen soils are dominant in the small areas of bottom land.

The soils in this association are used mainly for pasture and hay. Small fields of corn, silage, and small grain are on some farms. Practically every farm has a small tract of tobacco. The association is thickly populated with neat and well-kept farmsteads.

In this association farms average about 70 acres. Raising beef cattle and dairying are the main types of farming. Tobacco is the main cash crop. The potential for high-quality pasture and hay is exceptionally high. The acreage suitable for intensive cultivation is small and in odd-shaped areas. Much of the acreage can be cultivated if long cropping systems and other erosion control measures are used. Slope is the main limitation to farming and other land uses.

Figure 2.—Hay baling in sloping area of Decatur and Dewey soils. Trailer parks and subdivisions are gradually occupying much of the farmland.

Residential developments are encroaching on some areas (fig. 2). The soils in this association provide favorable homesites. Highway construction requires deep cuts and fills in some places and cutting in limestone rock near the base of the steeper slopes. Because the soils are permeable, pond reservoirs generally require chemical treatment before they will hold water. Ponds are an important source of water for livestock throughout the association.

Rolling to Steep Soils Underlain by Intermittent Bands of Limestone and Soft Shale

The two associations in this group appear as narrow, elongated valleys sandwiched between high linear ridges. The soils range from rolling to steep, and outcrops of limestone rock are common in most places.

4. *Talbott-Rock outcrop association*

Rolling to steep soils less than 3½ feet deep over limestone, and rock outcrop; in long narrow valleys

This association is in long, narrow valleys that extend across the counties in a southwest to northeast direction. It mostly lies between prominent sandstone ridges.

This association is dominantly hilly and rough, though it ranges from rolling to steep. In most places the surface is deeply pitted by limestone sinks. Outcrops of limestone rock dot the surface throughout the association, and in places they occupy as much as 90 percent of the surface area. Permanent streams flow along the center of the valleys. In some places these streams continue for several miles before they flow out of the valleys through gaps in the tall ridges.

This association makes up about 7 percent of the counties. It is about 75 percent Talbott soils and Rock outcrop. The remaining 25 percent is minor soils.

Talbott soils are well drained. Depth to rock ranges from 20 to 40 inches. There are, however, cracks or vertical joints in the limestone rock where reddish plastic clay extends to a depth of many feet. These cracks or joints are sometimes called solution channels. Talbott soils have a surface layer of brown silt loam only a few inches thick and a subsoil of reddish, plastic clay. Areas of Talbott soils range in size from very small patches between the rocks to tracts of 4 or 5 acres having only an occasional outcrop.

Minor soils in this association are mainly Hamblen soils on narrow strips of bottom lands and Whitwell soils on adjacent lower terraces. They are moderately well drained and loamy to a depth of several feet.

Nearly all of the acreage on uplands is used for pasture. Some is idle and in bushes. There are some small tracts of heavily cut-over forest. Redcedar and redbud are common both in the forest and in abandoned fields. Small patches of corn, hay crops, tobacco, and garden crops are on the narrow strips of bottom land, foot slopes, and benches.

In this association farms average about 75 acres. Some farms extend beyond this association to the top of adjacent ridges. Raising beef cattle is the main type of farming. Tobacco is the main cash crop. Trees are harvested for fenceposts and lumber in the more rocky, forested areas. There is substantial off-farm employment.

Farming is very limited because only a small acreage is suited to cultivation. Lespedeza and tall fescue grow well where the soils are not too rocky to control the invasion of brushy growth. Volunteer stands of bluegrass grow well in spring when moisture is plentiful.

Limitations are severe for engineering works, especially highway construction. Cuts require excavation of several feet of massive limestone.

5. *Montevallo-Talbott-Rock outcrop association*

Hilly and steep soils less than 3½ feet deep over shale or limestone, and limestone outcrops; in long narrow valleys

This association is in long, narrow, straight valleys that cross the entire survey area in a southwest to northeast direction. These valleys are only 1 to 2 miles wide, but they are many miles long. On the sides of the valleys are high, even-crested sandstone and siltstone mountains that rise as much as 1,000 feet or more above the valleys.

This association is dominantly hilly and steep. In some places it is very rough because of deep pitting by limestone sinks. In many places outcrops of limestone are common. The small acreage of smooth land in this association is mostly in narrow strips along the streams and adjacent low terraces. Small permanent streams meander for several miles through the valleys, then flow through deeply cut gaps in the ridges.

This association makes up about 13 percent of the survey area. It is about 40 percent Montevallo soils and 35 percent Talbott soils and Rock outcrop. The remaining 25 percent is small areas of minor soils.

The soils in this association are in long, narrow bands that are parallel with the valleys. The Montevallo soils are side by side with the Talbott soils. Within the bands the Talbott soils are in small patches among the outcrops of limestone, or they are in areas, a few acres in size, that have a few outcrops in places.

Montevallo soils are shallow, shaly, and droughty. Soft shale is at a depth of 20 inches or less. Above the shale is brownish silt loam that contains many shale fragments.

Talbott soils have a thin, silty surface layer and a reddish, plastic, clayey subsoil. In many areas the surface layer of these soils is eroded and, therefore, is also clayey and plastic.

Rock outcrop extends from a few inches to as much as

4 feet above the land surface. In places it occupies as much as 80 to 90 percent of the land surface.

Minor soils in this association mainly are moderately well drained, loamy Hamblen soils on the creek bottoms and moderately well drained Whitwell soils on low terraces next to the bottoms.

About two-thirds of the acreage is cleared and is used mostly for grazing. Scattered areas are in trees, mainly redcedar, hickory, and redbud. Fenceposts and lumber are harvested. Small areas on the bottom lands and foot slopes are in row crops and hay.

In this association farms average about 75 acres. Raising beef cattle is the main type of farming. Tobacco is the main cash crop; a small acreage is grown on most farms. Some farms have been abandoned, and off-farm employment is common. The potential for farming is low because of the Rock outcrop, shallow soils, or steep slopes, or a combination of these.

The hilly topography and outcrops of rock are severe limitations for engineering works, especially for highways. Cuts in the shale can be made with grading equipment, but those in the limestone require drilling and blasting. Pond reservoirs generally hold water where underlain by shale. Seepage is generally excessive where areas are underlain by the cavernous limestone.

Hilly and Steep Soils on Mountain Back Slopes

The one association in this group consists of deep and moderately deep, excessively drained and well-drained soils that are dominantly hilly and steep.

6. *Hayter-Litz association*

Hilly and steep soils 1½ to 6 or more feet deep over shale or limestone; on mountain back slopes

This association is in long, narrow bands on north-facing talus slopes. It forms the southern walls of narrow, deep valleys. It is somewhat dissected by fairly deep drainageways, many of which converge into common channels toward the base of the slopes. The slopes are exceptionally long.

This association is dominantly hilly and steep (fig. 3). There are no permanent streams, because the association does not reach down to the center of the valleys where the streams are located.

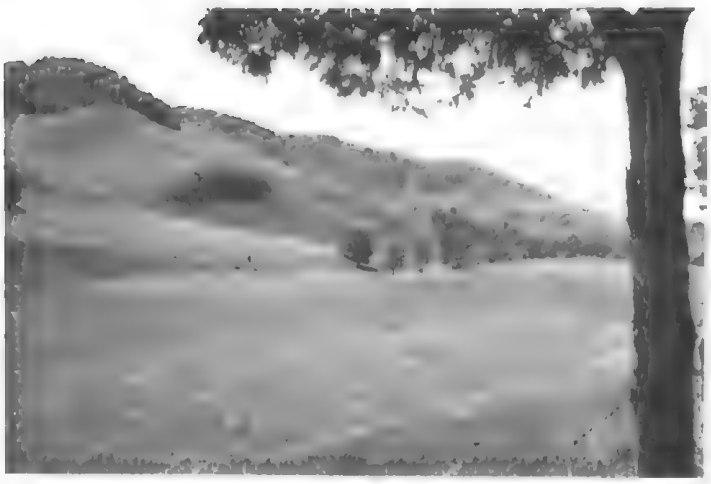

Figure 3.—Area of a Hayter cobbly loam on steep mountain back slopes.

This association makes up about 3 percent of the survey area. It is about 70 percent Hayter soils and 15 percent Litz soils. The remaining 15 percent is minor soils.

Hayter soils formed in sediment that crept down from the higher ridges. They have a dark-brown, loamy surface layer and a brown, friable, loamy subsoil. They are more than 40 inches deep to rock and have few to common fragments of siltstone and sandstone on the surface and in the soil.

Litz soils formed in place from shale. They are in very small tracts on short, steep slopes and on the points of hills. They have a surface layer of brown silt loam and a subsoil of yellowish-brown, shaly silty clay loam. Depth to shale rock is 20 to 40 inches.

Minor soils in this association are mainly reddish, clayey Talbott soils on uplands and narrow strips of well-drained, gravelly Sensabaugh soils along some of the drainageways.

Most of this association is used for pasture. The steeper parts next to the adjacent mountains are in high-quality hardwood forest.

In this association farms average about 100 acres. Few farms are entirely within the association. This association contains the back part of most farms whose homesteads are in the valleys below. Raising beef cattle is the main type of farming. Tobacco is the main cash crop.

Steep slope is the main limitation to farming. Suitable pasture is plentiful, though it is a little steep and difficult to mow. Pasture plants such as bluegrass, orchardgrass, and tall fescue grow well on these cool, north-facing slopes. The acreage suitable for cultivation is small.

Slope and hillside slippage are the main limitations to engineering works. Large landslides are likely if cuts are made in the slopes.

Hilly to Very Steep Soils on Mountains and Shale Ridges and Foot Slopes

Two associations are in this group. The soils contain many small rock fragments and are loamy. They are dominantly less than 3½ feet deep over bedrock and are steep or very steep.

7. *Wallen-Jefferson association*

Hilly to very steep, gravelly soils 1½ to 5 feet or more deep over sandstone and shale; on sandstone mountains and foot slopes

This association is on long, almost straight and narrow sandstone mountains that cross the survey area from the southwest to the northeast. The largest part of the acreage is in areas on south-facing slopes. The soils extend a short distance down the north-facing slopes. The soils are quite thin, and outcrops of sandstone rock are common on the crests and upper parts of the mountain ridges. The soils become gradually deeper as distance increases downslope; the soils on the lower one-third to one-half of the slopes are generally 3 to 5 feet deep. In most places fragments of sandstone are scattered over the surface and in the soil.

This association makes up about 19 percent of the survey area. It is about 50 percent Wallen soils and 15 percent Jefferson soils. The remaining 35 percent is minor soils.

Figure 4.—**Wallen soils on parallel wooded ridges. Sewanee soils are on bottom lands.**

Wallen soils are on crests and upper slopes of the mountains (fig. 4). They are gravelly throughout. Depth to rock is about 20 to 40 inches. Some of the areas are small patches among outcrops of sandstone.

Jefferson soils are on the lower part of the mountainsides and in coves where the larger trees grow. They are generally gravelly or cobbly. Bedrock is at a depth of 40 to 60 inches or more.

Minor soils are deep, cobbly Bouldin soils in a few of the coves and on lower slopes; well-drained Ealy and moderately well drained Sewanee soils in narrow strips on bottom lands; and Sequatchie and Whitwell soils in a few small tracts on low terraces next to the narrow bottoms.

About 75 percent of this association consists of mixed hardwoods and pines. The cleared part is mainly along the extremely narrow valleys and on the less steep foothills of the mountains; here, small patches of corn, tobacco, garden crops, and hay are grown, but most of the acreage is used for pasture.

The size of land holdings ranges from a few acres to several hundred acres. The potential for forestry and for recreational uses is good. Suitable sites for camping and picnicking are plentiful along the cool mountain streams that flow through much of the association. Food and cover for wildlife are available.

Highway construction generally requires the removal of massive sandstone rock. Landslides are likely when cuts are made in the steep slopes.

8. Lehew-Wallen-Calvin association

Steep and very steep, shaly and gravelly soils 1 to 3 feet deep over shale and sandstone; on high hills and ridges

This association is on long and steep ridges and rounded high hills and knobs. The ridges and hills are highly dissected by deep hollows. These hollows are V-shaped near the heads but widen into narrow, level strips as they approach permanent streams that flow through the narrow, winding valleys. Narrow, discontinuous strips of bottom land are along the valley streams, and small tracts of low terraces are next to the bottoms. Smooth areas of 2 to 3 acres are on foot slopes of some of the hills and ridges. All of the association is underlain by multicolored siltstone, sandstone, and shale. Soils derived from these rocks generally are dominant in the area.

This association makes up about 12 percent of the survey area. It is about 35 percent Lehew soils, 20 percent Wallen soils, and 15 percent Calvin soils. The remaining 30 percent is minor soils.

Lehew soils are reddish, are loamy, and have many small fragments of reddish and brownish rock on the surface and in the soil. Multicolored sandstone, siltstone, and shale are at a depth of about 20 to 40 inches. These soils are on the long, high ridges.

Wallen soils are similar to Lehew soils, but Wallen soils lack the reddish color of Lehew soils. Much of the acreage of Wallen soils is in areas on south- and west-facing slopes opposite Calvin soils, which are in areas on north- and east-facing slopes. Calvin soils are reddish, are loamy, and have many fragments of reddish shale on the surface and in the soil. Rock is at a depth of about 2 to 3 feet.

Minor soils in this association are very shaly Montevallo soils on some of the hills below the higher ridges, making up approximately 10 percent of the association; well-drained Ealy and moderately well drained Sewanee soils in small areas on bottom lands; well-drained, gravelly Sensabaugh soils in narrow strips in the valleys; and Sequatchie and Whitwell soils in the few small areas of low terraces that lie a few feet above the first bottoms.

About two-thirds of the association is in heavily cutover, dominantly hardwood forest. Most of the rest is in pasture. Small areas of corn, tobacco, garden crops, and hay are grown in the narrow valleys.

In this association farms average about 100 acres. Raising a few beef cattle is the main type of farming. Tobacco is the main, and on most farms the only, cash crop. Suitable pasture is scarce because of steep slopes. Natural fertility is low in the upland soils, and nearly all of these soils are gravelly or shaly. Soils suitable for cultivation are in small areas in the narrow, winding valleys. Off-farm employment is common, and many of the farmers are retired. The potential for forestry, recreational use, and limited farming is good.

The soils are severely limited for engineering works, especially highway construction. Deep cuts and removal of rock are required. Hillside slipping is likely when cuts are made in the long, steep slopes. Since most areas of the lower lying soils are underlain by slowly permeable shale, pond reservoirs generally hold water.

Undulating to Hilly Soils Underlain by Soft Shale

Two associations are in this group. The soils are underlain dominantly by soft shale at a depth of 1 to 4 feet. Very shaly soils and soils that have a subsoil of reddish silty clay are side by side. These associations are dominantly rolling, but they range from undulating to hilly.

9. Sequoia-Montevallo association

Undulating to hilly soils 1 to 3½ feet deep over shale; on uplands

This association is in an undulating to hilly, valley-like area. The low-lying hills are somewhat rounded and

have broad, gently rolling tops and short, moderately steep sides. Some of the hills are long and narrow, have sharp crests, and are only a few feet high. The area is drained by numerous crooked, meandering drainageways and, in a few places, by shallow depressions. In a few places there are ledges of limestone outcrop a few feet wide that run parallel with the valley.

This association makes up only about 1 percent of the survey area. All of it is in Hawkins County. It is about 60 percent Sequoia soils and 20 percent Montevallo soils. The remaining 20 percent is minor soils.

Sequoia soils, where not severely eroded, have a surface layer of brown silt loam and a subsoil of yellowish-red silty clay.

Montevallo soils are shaly silt loam over bedrock, which is at a depth of 20 inches or less.

Minor soils in this association are deep, loamy, well-drained Shouns soils along the outer edges of the association next to mountain slopes, shaly Litz soils on the short hillsides, and narrow strips of limestone outcrop and reddish Talbott and Dewey soils.

Practically all the acreage of this association has been cleared, and it is used mostly for pasture. Small fields of corn, hay, and tobacco are grown. The area is thickly populated with small farms and with nonfarm residences along the major highways.

In this association farms average about 70 acres. Raising beef cattle is the main type of farming. There are a few dairy farms. Tobacco is the main cash crop; a small acreage is grown on practically all farms. The potential for pasture and a beef cattle type of farming, supplemented by a small acreage of a cash crop such as tobacco, is fairly high. Practically all of the association is suitable for pasture. Soils suitable for row crops are in small areas.

In most places, cuts for road construction can be made in the shale rock with grading equipment. Most of the soils have percolation rates too slow for satisfactory functioning of septic tank drainage fields. This slow percolation, however, favors the area for water impoundment.

10. Shouns-Sequoia association

Undulating and rolling soils 2 to 5 or more feet deep over shale; mainly on foot slopes

This association is in a valley area that contains foot slopes of a high, long ridge on the northern side. It is dominantly undulating and rolling and has occasional short, steep slopes along the deeper drainageways.

This association makes up only about 1 percent of the survey area. It is about 60 percent Shouns soils and 15 percent Sequoia soils. The remaining 25 percent is minor soils.

Shouns soils are deep, reddish, loamy, and well drained. They are among the most desirable soils in the survey area.

Sequoia soils have a surface layer of brown silt loam and a subsoil of yellowish-red silty clay. Depth to shale is moderate.

Minor soils in this association consist of small areas of well-drained, gravelly Sensabaugh soils along drainageways and shaly Montevallo and Litz soils on a few of the steeper slopes.

***Figure 5.*—Residences in an area of a sloping Shouns silt loam.**

This association is probably the most densely populated in the survey area (fig. 5). It contains nearly all of the town of Rogersville. Much of the rest consists of home and business sites. There are a few small farms at the western end of the area that raise beef cattle and grow small patches of tobacco.

The part of the association that is not taken up by urban uses is well suited to farming. All of the association is well suited to pasture, and much is suited to cultivated crops.

About two-thirds of the area is suitable for homesites that must depend on septic tank drainage fields. In the rest of the area percolation rates are too slow for this use. Where sewerlines are available, practically all of the association is desirable for urban expansion. The location between scenic, high ridges makes this association a desirable place to live.

Undulating to Very Steep Soils Underlain by Hard Calcareous Shale

Three associations are in this group. The soils formed in material weathered from calcareous shale. Depth to shale ranges from only a few inches on the steeper hills to 4 or 5 feet in the small level areas. These associations are dominantly hilly and steep, but they range from undulating to very steep.

11. Dandridge-Whitesburg association

Steep soils less than 2 feet deep over shale rock and narrow strips of gently sloping soils 4 or more feet deep over shale rock; on hills and in hollows

This association is on high, winding hills and ridges that are deeply dissected by drainageways. These drainageways, or hollows, are V-shaped at the heads but widen gradually to narrow strips of level land as they approach permanent streams. Some of the association borders the Holston River flood plain.

This association is dominantly hilly and steep. Small tracts of level to rolling soils are on a few of the broader tops of hills, on foot slopes, and along streams. Most of these areas are no more than 2 or 3 acres in size. This

association is drained by many meandering small streams or creeks.

This association makes up about 9 percent of the survey area. It is about 80 percent Dandridge soils and 5 percent Whitesburg soils. The remaining 15 percent is minor soils.

Dandridge soils are on nearly all of the hills. Hard shale rock is at a depth of less than 20 inches, and there are many fragments of shale throughout the profile.

Whitesburg soils are moderately well drained, loamy soils that are in narrow strips in hollows.

Minor soils in this association include moderately deep, yellowish Needmore soils on the few hilltops broad enough to accommodate a 2- or 3-acre field and well-drained Sullivan soils and moderately well drained Hamblen soils in small tracts on bottom lands along meandering streams.

About 70 percent of the acreage is cleared, and most is used for pasture. Small fields of corn, tobacco, and hay are on the hilltops, in the hollows, and along the streams.

In this association farms average about 100 acres. Raising beef cattle is the main type of farming. There are a few dairy farms. Tobacco is the main cash crop; it is grown on practically all farms. Tobacco crops are generally grown in areas less than 1 acre. Off-farm employment is common.

The potential for beef cattle farming, supplemented by a small acreage of a cash crop such as tobacco, is fair. The potential for pasture on upland soils is fair. Many of the slopes are too steep for mechanized equipment. Pasture plants grow well in spring and early in summer when moisture is plentiful, but growth is poor during the drier months in summer and fall because available water capacity is low in the upland soils. Soils suitable for cultivation are in small, widely scattered areas.

Road construction requires deep cuts in the hard shale rock and deep fills to bridge the hollows. Water impoundment is nearly always successful because the underlying shale is impervious or nearly impervious. In many places this association is thickly populated with small farms and with residences along highways. Soils deep enough or permeable enough for successful operation of septic tank drainage fields are scarce.

12. *Dandridge-Needmore-Leadvale association*

Undulating to hilly soils 1½ to 5 feet deep over calcareous shale rock; on uplands and foot slopes

This association consists of relatively low-lying hills. Some of the hills have tops broad enough to accommodate 2- to 4-acre fields. Fairly large, smooth areas on foot slopes are between the narrow strips of bottom land and the uplands. The area is drained by common, crooked drainageways.

This association makes up about 3 percent of the survey area. All of it is in the southwest corner of Hawkins County. It is about 45 percent Dandridge soils, 20 percent Needmore soils, and 15 percent Leadvale soils. The remaining 20 percent is minor soils.

Dandridge soils are shaly. Hard calcareous shale rock is at a depth of 20 inches or less. The soils are on the hillsides.

Needmore soils are on the broader hilltops. They have a yellowish, clayey subsoil that is slowly permeable. Shale is at a depth of 20 to 40 inches.

Leadvale soils are moderately well drained and have a fragipan. They are on foot slopes.

Minor soils are moderately well drained Whitesburg soils in hollows and well-drained Sullivan soils and moderately well drained Hamblen soils in small areas on bottom lands along the winding streams.

About two-thirds of the acreage is in pasture. The rest is used for corn, hay, silage, small grain, and tobacco. Crops other than pasture are in small fields.

In this association farms average about 80 acres. Raising beef cattle and dairying are the main types of farming. Tobacco is the only cash crop of any importance. Suitable pasture is fairly plentiful, though some of the steeper soils are shallow and droughty. Soils suitable for row crops are in small areas.

Road construction requires much cutting in the hard shale rock and filling of the moderately deep hollows. The soils are generally neither permeable enough nor deep enough for successful operation of septic tank drainage fields. Pond reservoirs nearly always hold water because the underlying shale is practically impervious.

13. *Cynthiana-Litz association*

Steep, flaggy and shaly soils 1 to 3 feet deep over shale and limestone; on hills and ridges

This association consists of high, winding hills and ridges. It is dissected by common, deep, V-shaped hollows.

The association is dominantly steep but ranges from hilly to very steep. Small, discontinuous tracts of bottom land are along the creeks and branches. Typical areas are around the eastern end of Short Mountain east of Mooresburg and around the base of Devil's Nose north of Rogersville.

This association is underlain by interbedded, slabby limestone and calcareous shale. These rocks are vertically tilted, and their sharp edges protrude above the soil surface in many places.

This association makes up about 3 percent of the survey area. It is about 70 percent Cynthiana soils, 15 percent Litz soils, and 15 percent minor soils.

Cynthiana soils are somewhat clayey and have numerous slabs of limestone and chips of shale on the surface and in the soil. Hard shale and limestone are at a depth of less than 20 inches.

Litz soils have many fragments of shale on the surface and in the soil. Between the many shale fragments are silt loam and silty clay loam. Rippable shale is at a depth of about 20 to 30 inches.

Minor soils are mainly well-drained Sullivan and moderately well drained Hamblen soils on the narrow strips of bottom land along the creeks and branches. Small areas of well-drained, loamy Jefferson soils are along the outer edge next to mountain slopes of another association.

About 40 percent of the acreage is in forest of hardwoods and some redcedar. Most of the rest is in native pasture. Corn, tobacco, hay, and garden crops are grown in small patches along the creeks and branches and in the hollows.

In this association farms average about 100 acres. Practically all farmers raise a few beef cattle and grow a small field of tobacco. Some trees for lumber and fence-

posts are harvested. There is a substantial amount of off-farm employment.

Land suitable for cultivation is in small scattered tracts seldom larger than 2 or 3 acres. The uplands are rough and steep and are difficult to maintain in productive pasture.

Soil limitations to engineering works, especially road construction, are severe. Deep cuts in hard shale rock are required, and suitable fill material is scarce.

Undulating to Hilly Soils on River Terraces Underlain by Shale

One association is in this group. It consists of predominantly deep, loamy soils on river terraces. The soils are excessively drained to moderately well drained.

14. Holston-Cloudland-Dandridge association

Undulating and rolling soils 5 to 6 or more feet deep over shale and hilly soils less than 2 feet deep over shale; mainly on river terraces

This association is in sweeping bends of the Holston River. It is mainly on terraces along the river. The terraces are interrupted in a few places by protrusions of shale hills. They have a common pattern consisting of a narrow strip of first bottom along the river followed by a fairly broad area of low terrace only a few feet higher than the bottom; next is a short escarpment that goes up to a broad, undulating, plateaulike plain of high terraces.

The association is dominantly undulating and rolling, except for the steep escarpments separating the terrace levels and the few deep drainageways that have cut down to the shale.

This association makes up about 3 percent of the survey area. All of it is in Hawkins County. It is about 40 percent Holston soils, 10 percent Cloudland soils, and 10 percent Dandridge soils. The remaining 40 percent is minor soils.

Holston soils are deep, loamy, yellowish, and well drained. They are on the high terrace along with Cloudland soils, which are moderately well drained and have a fragipan. Dandridge soils are on the few shale hills that extend above the terrace plain. They are shallow and shaly.

***Figure 6.*—Book printing plant in Holston-Cloudland-Dandridge association. Most industries are in areas of Holston and Cloudland soils.**

Several important minor soils are in this association. Well-drained Staser soils and moderately well drained Lindside soils, both of which are loamy and fertile, are on the first bottoms along the river. On the low terraces are well-drained, loamy Statler soils and moderately well drained, loamy Altavista soils. Some large areas of poorly drained, gray Guthrie soils are on the flat parts of the old terraces.

This association is used for corn, silage, tobacco, hay, and pasture. Several industrial plants (fig. 6) are located here, and homesites are being developed on some tracts.

In this association farms average about 100 acres. Raising beef cattle and dairying are the main types of farming. Tobacco is the main cash crop.

The potential for farming is fairly high. The main limitations are wetness in some places and low fertility of the soils on the high terraces.

The presence of a slowly permeable fragipan over much of the association is a severe limitation for roads and residential sites, but areas of the Holston soils have slight limitations for most other uses.

Descriptions of the Soils

This section describes the soil series and mapping units in Hawkins and Hancock Counties. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile; that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

Preceding the name of each mapping unit is a symbol that identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland suitability group in which the mapping unit has been placed. The page for the description of each capability unit can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 3. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*6*).

TABLE 3.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Allen loam, 5 to 12 percent slopes	780	0.2
Allen loam, 12 to 20 percent slopes	1,110	.2
Allen loam, 20 to 35 percent slopes	620	.1
Altavista silt loam	980	.2
Bland-Rock outcrop complex, 20 to 40 percent slopes	3,890	.9
Bouldin cobbly loam, 20 to 60 percent slopes	2,250	.5
Calvin silt loam, 15 to 35 percent slopes	1,240	.3
Calvin silt loam, 35 to 60 percent slopes	2,240	.5
Calvin-Wallen complex, 25 to 60 percent slopes	17,460	3.8
Claiborne silt loam, 5 to 12 percent slopes	1,380	.3
Claiborne silt loam, 12 to 25 percent slopes	3,690	.8
Claiborne silt loam, 25 to 40 percent slopes	8,640	1.9
Claiborne soils, 15 to 35 percent slopes, severely eroded	230	.1
Clarksville cherty silt loam, 5 to 20 percent slopes	3,800	.8
Clarksville cherty silt loam, 20 to 40 percent slopes	8,150	1.8
Cloudland loam, 2 to 5 percent slopes	2,150	.5
Cloudland loam, 5 to 12 percent slopes	1,980	.4
Cynthiana flaggy silty clay loam, 5 to 20 percent slopes	1,270	.3
Cynthiana flaggy silty clay loam, 20 to 50 percent slopes	10,510	2.3
Dandridge shaly silty clay loam, 5 to 20 percent slopes	8,570	1.9
Dandridge shaly silty clay loam, 20 to 35 percent slopes	10,330	2.3
Dandridge shaly silty clay loam, 35 to 60 percent slopes	23,140	5.1
Decatur silt loam, 5 to 12 percent slopes	1,750	.4
Decatur silt loam, 12 to 20 percent slopes	460	.1
Dewey silt loam, 5 to 12 percent slopes	3,950	.9
Dewey silt loam, 12 to 20 percent slopes	1,930	.4
Dunmore silt loam, 5 to 12 percent slopes	9,560	2.1
Dunmore silt loam, 12 to 20 percent slopes	10,620	2.3
Dunmore silt loam, 20 to 35 percent slopes	3,300	.7
Dunmore silty clay loam, 12 to 25 percent slopes	550	.1
Dunning silty clay loam	250	.1
Ealy loam	500	.1
Emory silt loam	460	.1
Etowah silt loam, 2 to 5 percent slopes	1,060	.2
Etowah silt loam, 5 to 12 percent slopes	2,540	.6
Etowah silt loam, 12 to 25 percent slopes	480	.1
Fullerton cherty silt loam, 5 to 12 percent slopes	4,540	1.0
Fullerton cherty silt loam, 12 to 20 percent slopes	6,750	1.5
Fullerton cherty silt loam, 20 to 35 percent slopes	6,730	1.5
Gilpin silt loam, 25 to 50 percent slopes	2,330	.5
Greendale silt loam	2,080	.5
Guthrie silt loam	680	.1
Hamblen silt loam	8,840	1.9
Hartsells loam, 3 to 12 percent slopes	1,100	.2
Hartsells loam, 12 to 20 percent slopes	2,020	.4
Hayter loam, 3 to 12 percent slopes	1,950	.4
Hayter loam, 12 to 20 percent slopes	1,570	.4
Hayter loam, 20 to 35 percent slopes	2,260	.5
Hayter cobbly loam, 10 to 20 percent slopes	810	.2
Hayter cobbly loam, 20 to 35 percent slopes	2,340	.5
Hayter cobbly loam, 35 to 55 percent slopes	5,190	1.1
Holston loam, 2 to 5 percent slopes	2,300	0.5
Holston loam, 5 to 12 percent slopes	1,930	.4
Holston loam, 12 to 20 percent slopes	1,550	.3
Holston-Urban land complex	1,930	.4
Jefferson loam, 5 to 12 percent slopes	2,910	.6
Jefferson loam, 12 to 20 percent slopes	2,290	.5
Jefferson cobbly loam, 5 to 12 percent slopes	580	.1
Jefferson cobbly loam, 12 to 20 percent slopes	3,080	.7
Jefferson cobbly loam, 20 to 35 percent slopes	7,080	1.6
Leadvale silt loam, 2 to 5 percent slopes	1,110	.2
Leadvale silt loam, 5 to 12 percent slopes	2,470	.5
Leesburg gravelly loam, 10 to 20 percent slopes	560	.1
Lehew channery loam, 25 to 60 percent slopes	20,670	4.6
Lindside silt loam	830	.2
Litz shaly silt loam, 8 to 20 percent slopes	1,450	.3
Litz shaly silt loam, 20 to 35 percent slopes	2,940	.7
Litz shaly silt loam, 20 to 35 percent slopes, severely eroded	1,590	.3
Litz shaly silt loam, 35 to 60 percent slopes	7,570	1.7
Melvin silt loam	1,440	.3
Minvale silt loam, 2 to 5 percent slopes	440	.1
Minvale silt loam, 5 to 12 percent slopes	5,200	1.1
Minvale silt loam, 12 to 20 percent slopes	2,070	.5
Montevallo shaly silt loam, 8 to 25 percent slopes	4,550	1.0
Montevallo shaly silt loam, 25 to 50 percent slopes	21,660	4.8
Montevallo-Talbott complex, 20 to 45 percent slopes	6,350	1.4
Needmore silt loam, 2 to 5 percent slopes	800	.2
Needmore silt loam, 5 to 12 percent slopes	2,310	.5
Nella cobbly loam, 5 to 12 percent slopes	340	.1
Nella cobbly loam, 12 to 20 percent slopes	1,800	.4
Nella cobbly loam, 20 to 45 percent slopes	5,230	1.2
Rock outcrop-Talbott complex, 10 to 40 percent slopes	13,130	2.9
Sensabaugh gravelly loam	3,720	.8
Sequatchie loam	780	.2
Sequoia silt loam, 3 to 12 percent slopes, eroded	3,260	.7
Sequoia silt loam, 12 to 20 percent slopes, eroded	2,750	.6
Sewanee loam	2,760	.6
Shouns silt loam, 3 to 12 percent slopes	3,950	.9
Shouns silt loam, 12 to 25 percent slopes	2,750	.6
Staser silt loam	4,810	1.1
Statler silt loam	830	.2
Sullivan loam	2,670	.6
Taft silt loam	1,340	.3
Talbott silt loam, 5 to 12 percent slopes, eroded	2,560	.6
Talbott silt loam, 12 to 25 percent slopes, eroded	1,830	.4
Talbott silty clay, 12 to 25 percent slopes, severely eroded	610	.1
Talbott-Rock outcrop complex, 5 to 20 percent slopes	5,220	1.1
Talbott-Rock outcrop complex, 20 to 50 percent slopes	24,360	5.4
Wallen gravelly loam, 25 to 60 percent slopes	21,810	4.8
Wallen-Rock outcrop complex, 25 to 60 percent slopes	26,890	5.9
Whitesburg silt loam	2,950	.7
Whitwell loam	1,280	.3
Water, quarries	8,100	1.8
Total	454,400	100.0

Allen Series

The Allen series consists of deep, loamy, well-drained soils on benches and foot slopes of sandstone and siltstone mountains. The soils formed in material that washed or rolled downslope from higher areas. Slopes range from about 5 to 35 percent.

In a representative profile the surface layer is brown, very friable loam about 7 inches thick. The subsoil, to a depth of 15 inches, is strong-brown, friable loam. Below this is yellowish-red, friable clay loam that grades to red clay at a depth of 50 inches. A few sandstone pebbles and cobbles are throughout the profile.

Permeability is moderate, and available water capacity

is medium. Reaction is strongly acid and very strongly acid, except where the surface layer has been limed. The soils are easy to work, and crops respond well to management.

About half of the acreage of these soils has been cleared and is used for tobacco, pasture, hay, corn, and small grain. Some of the remaining acreage is in hardwood trees, and some of the formerly cleared areas are reverting to pine and hardwood forest.

Representative profile of Allen loam, 12 to 20 percent slopes:

Ap—0 to 7 inches, brown (10YR 5/3) loam; weak, fine, granular structure; very friable; many roots; about 5 percent, by volume, sandstone pebbles; strongly acid; abrupt, smooth boundary.

B1—7 to 15 inches, strong-brown (7.5YR 5/6) loam; weak, medium, subangular blocky structure; friable; common roots; about 5 to 10 percent, by volume, sandstone gravel; strongly acid; clear, smooth boundary.

B21t—15 to 28 inches, yellowish-red (5YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable; few roots; discontinuous clay films on faces of peds; about 10 percent, by volume, sandstone gravel; strongly acid; gradual, smooth boundary.

B22t—28 to 50 inches, yellowish-red (5YR 5/8) clay loam; strong, medium, subangular blocky structure; friable; continuous clay films on faces of peds; about 10 percent, by volume, sandstone gravel; very strongly acid; gradual, smooth boundary.

B3—50 to 70 inches, red (2.5YR 4/8) clay; weak, coarse, subangular blocky structure; firm, slightly plastic; discontinuous clay films on faces of peds; very strongly acid.

The A horizon is brown, yellowish-brown, or strong-brown loam or sandy loam. It is 5 to 10 inches thick.

The B1 horizon is thin or is absent in some profiles. The B2t horizon is red or yellowish-red clay loam that ranges to red or dark-red clay in the lower part.

Bedrock of shale, siltstone, or sandstone is at a depth of more than 6 feet.

AnC—Allen loam, 5 to 12 percent slopes. This is a deep, loamy, sloping, well-drained soil. It is on benches and mountain foot slopes.

The surface layer is brown, friable loam about 5 to 9 inches thick. The subsoil is yellowish-red clay loam several feet thick.

Included with this soil in mapping are a few small areas of a deep, loamy, brownish soil. Also included are a few small areas of soils that are similar to this Allen soil, but sandstone, cobbles, and gravel make up about 15 to 25 percent, by volume, of the profile. A few small areas of eroded soils that have a surface layer of reddish clay loam are also included.

This soil is well suited to the commonly grown crops. It is well suited to use as homesites and to other engineering uses. Steepness of slope is the main concern of management for most uses. Capability unit IIIe–1; woodland suitability group 3o7.

AnD—Allen loam, 12 to 20 percent slopes. This is a deep, loamy, reddish, well-drained soil on mountain foot slopes. It formed in materials that washed or rolled from soils on the sandstone and siltstone mountains. This soil has the profile described as representative of the series.

The surface layer is brown, friable loam about 6 to 8 inches thick. The subsoil is yellowish-red, friable clay loam that extends to a depth of several feet.

Included with this soil in mapping are a few small areas of soils that are similar to this Allen soil, but sandstone cobbles and gravel make up about 15 to 25 percent, by volume, of the profile. Also included are a few small areas of a soil that has shale or siltstone bedrock at a depth of about 3 feet and a few small, eroded areas that have a surface layer of reddish clay loam.

Strong slopes are the main concern of management. If erosion is adequately controlled, this soil is suited to the commonly grown crops. Slope is the main limitation to such engineering uses as homesites. Capability unit IVe–1; woodland suitability group 3o7.

AnE—Allen loam, 20 to 35 percent slopes. This is a deep, loamy soil on foot slopes of the sandstone mountains.

The surface layer is brown, friable loam about 6 inches thick. In wooded areas the upper 1 or 2 inches is stained darker by organic matter. The subsoil is yellowish-red or red clay loam to a depth of 5 feet or more.

Included with this soil in mapping are a few areas of a deep, loamy soil that has about 15 to 25 percent, by volume, sandstone cobbles and gravel. A few small areas of somewhat shallower soils over sandstone or siltstone bedrock are also included.

Steepness of slope is a limitation to the use of this soil for pasture and woodland. Slope and hillside slippage are the main limitations to engineering. Large landslides are likely if cuts are made in the slopes. Capability unit VIe–1; woodland suitability group 3r8.

Altavista Series

The Altavista series consists of loamy, deep, moderately well drained soils on low terraces of rivers. The soils formed in mixed alluvium from these rivers. Slopes range from 0 to 2 percent.

In a representative profile the surface layer is brown silt loam about 9 inches thick. The subsoil is yellowish-brown, friable silt loam and clay loam that extends to a depth of 42 inches. It is mottled in the lower part with shades of gray and brown. Below a depth of 42 inches is friable loam mottled in shades of gray, brown, and yellow.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid and medium acid, except where the surface layer has been limed. The soils are easy to work, and crops respond very well to management.

Altavista soils are used for corn, small grain, tobacco, hay, and pasture.

Representative profile of Altavista silt loam:

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; many fine roots; slightly acid; clear, smooth boundary.

B2t—9 to 23 inches, yellowish-brown (10YR 5/6) silt loam; common, medium, faint, brown (10YR 5/3) mottles; weak, medium, subangular blocky structure; friable; common patchy clay films; medium acid; few sandstone cobbles; gradual, smooth boundary.

B3—23 to 42 inches, yellowish-brown (10YR 5/8) clay loam; common, coarse, yellowish-brown (10YR 5/4) and light brownish-gray (10YR 6/2) mottles; weak, coarse, subangular blocky structure; friable; few water-rounded sandstone pebbles 1 to 3 inches in diameter; few worm casts and root holes filled with dark grayish-brown silt loam; strongly acid; clear, smooth boundary.

C—42 to 60 inches, mottled light brownish-gray (10YR 6/2), strong-brown (7.5YR 5/6), and yellowish-brown (10YR 5/4) loam; massive; very friable, strongly acid; few black concretions.

The Ap horizon is brown, dark-brown, or grayish-brown silt loam or loam. It is 5 to 10 inches thick.

The Bt horizon is strong-brown, brown, or yellowish-brown silt loam, silty clay loam, or clay loam. The B3 horizon is mottled brown, yellow, and gray loam, silt loam, or clay loam. Below this horizon is stratified sediment.

Shale bedrock is at a depth of more than 6 feet.

At—Altavista silt loam. This is a nearly level, moderately well drained, loamy soil on low river terraces. It is above flood level, although water does stand on it in the low places for very brief periods.

Included with this soil in mapping are a few small areas of a well-drained soil and a few areas of a somewhat poorly drained soil.

Row crops can be grown every year on this soil. It responds well to management. Among the suited crops are small grain, silage, corn, hay, and pasture. Alfalfa is likely to be short-lived on this soil, because in winter and in spring a seasonally high water table saturates the soil to within 2 or 3 feet of the surface.

Unless extensively drained, this soil is generally unsuited to uses such as homesites because the water table is seasonally high. Capability unit IIw–1; woodland suitability group 2w8.

Bland Series

The Bland series consists of moderately deep soils in narrow strips and patches between outcrops of reddish limestone on uplands. The soils are near the outer edge of the limestone valleys. They formed in material derived from red, clayey limestone. Bedrock is at a depth of about 20 inches to 3 feet, but it is mostly at a depth of 20 to 25 inches. Slopes are 20 to 40 percent.

In a representative profile the surface layer is dark reddish-gray silty clay loam about 5 inches thick. The subsoil is reddish-brown, plastic silty clay and clay. Limestone bedrock is at a depth of 25 inches.

Permeability is moderately slow, and available water capacity is low. Reaction is neutral to medium acid.

Some areas are used for unimproved pasture, but most have been abandoned and are reverting to scrub woodland of redcedar, honeylocust, wild plum, and redbud.

Representative profile of Bland silty clay loam in an area of Bland-Rock outcrop complex, 20 to 40 percent slopes:

Ap—0 to 5 inches, dark reddish-gray (5YR 4/2) silty clay loam; moderate, fine and medium, granular structure; friable; many roots; few, small, angular, reddish limestone fragments; neutral; clear, wavy boundary.

B21t—5 to 11 inches, reddish-brown (5YR 4/3) silty clay; strong, medium and fine, subangular and angular blocky structure; firm, slightly sticky and plastic; common roots; discontinuous dark reddish-brown (5YR 3/2) ped coats; few fine pores; few reddish limestone fragments; neutral; gradual, irregular boundary.

B22t—11 to 21 inches, reddish-brown (5YR 4/3) clay; moderate, medium and fine, subangular blocky structure; firm, plastic; continuous clay films on peds and rock fragments; about 15 percent, by volume, reddish limestone fragments; neutral; clear, irregular boundary.

B3—21 to 25 inches, reddish-brown (5YR 4/3) silty clay; weak, coarse, granular and medium, subangular blocky structure; firm, plastic; clay films on some peds; about 15 percent, by volume, reddish limestone fragments and shale chips; neutral.

The Ap horizon is dark reddish-gray or reddish-brown silty clay loam or silty clay. It is 3 to 6 inches thick.

The B horizon is reddish-brown, weak-red, or dusky-red silty clay or clay. The part of the B horizon immediately above bedrock is about 50 percent, by volume, flaggy limestone fragments. This layer is as much as 12 inches thick.

Limestone bedrock is at a depth of 20 inches to 3 feet, but it is commonly in the shallow part of this range.

BdE—Bland-Rock outcrop complex, 20 to 40 percent slopes. This complex is on steep hills and ridges. It is in long belts that are uninterrupted for about a mile.

This complex is about 40 to 65 percent Bland soils and 25 to 50 percent Rock outcrop of reddish limestone. The Bland soils are in narrow strips and patches between the outcrops.

Included in this complex are narrow strips of a yellowish-red, clayey soil. Also included are small areas of a soil in narrow hollows and along drainageways; this soil has a surface layer of brown friable loam and a subsoil of yellowish-brown, friable loam. Slopes in a few areas range from 8 to 20 percent.

This complex is poorly suited to most uses. It is better suited to forest than to most other uses. Bluegrass in some areas can be grazed, but weed and brush control is difficult and expensive. Capability unit VIIs–1; woodland suitability group 5x3.

Bouldin Series

The Bouldin series consists of deep, cobbly soils that formed in materials that rolled or washed from steep sandstone mountainsides. Slopes range from about 20 to 60 percent.

In a representative profile the surface layer is brown cobbly loam about 8 inches thick. The upper 2 inches is stained darker by organic matter. The subsoil is brown and strong-brown cobbly loam and cobbly clay loam to a depth of 65 inches. Sandstone cobbles and stones make up about 30 to 60 percent, by volume, of the profile.

Permeability is moderately rapid, and available water capacity is low. Reaction is strongly acid and very strongly acid. High stone content makes cultivation of these soils impracticable. These soils support good stands of mixed hardwoods if they are protected from fire and grazing.

Nearly all areas of these soils are in forest. A few small areas have been cleared of surface stones and are in pasture.

Representative profile of Bouldin cobbly loam, 20 to 60 percent slopes:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) cobbly loam; weak, fine, granular structure; very friable; many roots; about 30 percent covered by sandstone cobbles and boulders as much as 2 feet across and a few as much as 4 feet across; abrupt, wavy boundary.

A2—2 to 8 inches, brown (10YR 5/3) cobbly loam; weak, fine and medium, granular structure; very friable; many roots; about 40 percent, by volume, sandstone cobbles and stones; strongly acid; clear, wavy boundary.

B1—8 to 20 inches, brown (7.5YR 5/4) cobbly loam; weak, medium and fine, subangular blocky structure; very friable; common roots; about 40 percent, by volume, sandstone cobbles and stones; strongly acid; gradual, wavy boundary.

B22t—20 to 42 inches, strong-brown (7.5YR 5/6) cobbly loam; weak, medium, subangular blocky structure; friable; patchy clay films; few roots; about 50 percent, by volume, sandstone cobbles and stones; very strongly acid; gradual, wavy boundary.

B23t—42 to 65 inches, strong-brown (7.5YR 5/6) cobbly clay loam; few, fine, pale-brown mottles; moderate, med-

ium, subangular blocky structure; friable; discontinuous clay films; about 50 percent, by volume, sandstone cobbles and stones; strongly acid.

Stones make up about 30 to 60 percent, by volume, of the profile.

The A horizon is cobbly loam or cobbly sandy loam.

The fine-earth fraction of the B horizon is brown to yellowish red clay loam, sandy clay loam, or loam.

Bedrock is at a depth of more than 6 feet.

BoF—Bouldin cobbly loam, 20 to 60 percent slopes. This is a cobbly, steep, deep, well-drained soil on foot slopes and sides of mountains. It formed in materials that washed or rolled downslope from steeper areas of sandstone mountains.

Included with this soil in mapping are a few small areas in narrow drainageways where running water has removed most of the soil material, leaving as much as 90 percent, by volume, stones.

This soil is suited to forest. It has esthetic and recreational potential. High stone content and steepness of slope are limitations to most other uses. Capability unit VIIs–1; woodland suitability group 3x9.

Calvin Series

The Calvin series consists of moderately deep, shaly, excessively drained soils on hillsides, ridges, and low irregular hills. The soils formed in material weathered from maroon or reddish shale. Slopes are 15 to 60 percent.

In a representative profile the surface layer is reddish-brown silt loam about 5 inches thick. Below this is reddish-brown, friable shaly silt loam. Reddish shale bedrock is at a depth of about 25 inches.

Permeability is moderate, and available water capacity is low. Runoff is medium to rapid. Natural fertility is low. Reaction is strongly acid, except where the surface layer has been limed. The soils respond poorly to management.

Calvin soils are used mainly for pasture and woodland (fig. 7).

Representative profile of Calvin silt loam, 15 to 35 percent slopes:

Ap—0 to 5 inches, reddish-brown (5YR 5/3) silt loam; weak, medium and fine, granular structure; very friable; many roots; few, small, weathered fragments of reddish shale; strongly acid; clear, smooth boundary.

B2—5 to 15 inches, reddish-brown (5YR 4/4) shaly silt loam; moderate, medium, angular blocky structure; friable; few roots; about 30 percent, by volume, soft and hard reddish shale fragments; strongly acid; gradual, wavy boundary.

C—15 to 25 inches, reddish-brown (5YR 4/4) shaly silt loam; massive; friable; about 75 percent, by volume, reddish shale fragments; strongly acid.

R—25 inches, reddish shale.

The A horizon is silt loam, loam, or shaly silt loam. It is 3 to 6 inches thick.

The B horizon is reddish-brown to dusky-red shaly silty clay loam or shaly silt loam.

Depth to rock is about 2 feet in most places, but it ranges from 20 to 35 inches.

CaE—Calvin silt loam, 15 to 35 percent slopes. This is an excessively drained, steep, moderately deep, shaly soil on hillsides. It is underlain by maroon shale. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of

Figure 7.—Calvin soils on steep ridge in background are fair for pasture and are used for grazing. Note "stepped" soil creep on slopes to left. Sullivan soils are on nearly level flood plain in foreground.

soils that are less than 20 inches deep over bedrock. A few shallow gullies are in some areas.

This soil is fairly well suited to native pasture and to adapted trees. Steepness of slope, limited depth, and low available water capacity are major concerns of management. Drought-tolerant species are better suited to this soil than other species, because there are dry periods in summer. Tall fescue, sericea lespedeza, and pine trees are examples of suitable plants. Making deep cuts in slopes may result in massive landslides. Capability unit VIe–3; woodland suitability group 4f3.

CaF—Calvin silt loam, 35 to 60 percent slopes. This is an excessively drained, very steep, shaly soil on the sides of the ridges. It is underlain by maroon shale.

The surface layer is reddish-brown silt loam 3 to 5 inches thick. The subsoil is reddish-brown, weak-red, or dusky-red shaly silty clay loam or shaly silt loam. Bedrock is at a depth of 20 to 30 inches. Reddish shale fragments make up nearly one-half of the soil volume.

Included with this soil in mapping are small areas of soils that are less than 20 inches deep to bedrock. Also included are a few small spots where all the soil material has washed away, leaving the bedrock exposed.

This soil is only fairly well suited to adapted trees. Capability unit VIIe–1; woodland suitability group 4f3.

CcF—Calvin-Wallen complex, 25 to 60 percent slopes. This complex is on steep, highly dissected ridges of siltstone that is interbedded with layers of shale. It consists of about equal parts of gravelly and shaly, moderately deep Calvin and Wallen soils. These soils occur in small intricate patterns and cannot be shown separately on the soil map.

Calvin and Wallen soils have a profile similar to the one described as representative of their respective series. Calvin soils are generally on choppy, steep slopes that face east and north. Wallen soils are on slopes that face south and west.

Included with this complex in mapping are small areas of soils at the base of slopes. These soils have a somewhat thicker surface layer than Calvin and Wallen soils. Also included are a few small areas where bedrock is exposed in massive slabs and in narrow, steeply dipping ledges.

These soils are suited to adapted trees. Where the soils are above deep road cuts, they are subject to sliding. Capability unit VIIe–1; woodland suitability group 4f3.

Claiborne Series

The Claiborne series consists of deep, loamy, well-drained soils on north- and east-facing slopes of high hills and ridges. The soils formed in material weathered from dolomitic limestone. They have a small amount of chert fragments on the surface and in the profile. Slopes range from 5 to 40 percent.

In a representative profile the surface layer is dark-brown silt loam about 8 inches thick. The upper part of the subsoil to a depth of 46 inches is reddish-brown and yellowish-red, friable silt loam and silty clay loam. The lower part to a depth of 85 inches or more is red and yellowish-red, firm clay.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid or very strongly acid, except where the surface layer has been limed. The soils are easy to work and, except for the slopes, respond favorably to good management.

Claiborne soils are used for corn, tobacco, small grain, hay, and pasture. A large part of the acreage is in young volunteer stands of yellow-poplar.

Representative profile of Claiborne silt loam, 5 to 12 percent slopes:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, medium, granular structure; friable; many roots; many fine and medium pores; few fine chert fragments; medium acid; clear, smooth boundary.

B1—8 to 17 inches, reddish-brown (5YR 4/4) silt loam; moderate, medium, subangular blocky structure; friable; many fine and medium roots; many fine and medium pores; about 8 percent, by volume, angular fragments of chert 1 to 3 inches in size; strongly acid; clear, smooth boundary.

B21t—17 to 28 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable; few fine roots; common medium pores; thin patchy clay films on peds and in pores; few, fine, black concretions; about 8 percent, by volume, fragments of chert 1 to 2 inches in size; strongly acid; gradual, smooth boundary.

B22t—28 to 46 inches, yellowish-red (5YR 4/8) silty clay loam; moderate, medium, subangular blocky structure; friable; few fine roots; common medium pores; thin patchy clay films on peds; about 10 percent, by volume, fragments of chert about 1 inch in size; strongly acid; gradual, smooth boundary.

B23t—46 to 70 inches, red (2.5YR 4/8) clay; moderate, medium, subangular blocky structure; firm; thin continuous clay films on peds; common, fine and medium, dark-brown and black concretions; about 8 percent, by volume, fragments of chert about 1 inch in size; strongly acid; gradual, smooth boundary.

B3—70 to 85 inches, yellowish-red (5YR 5/8) clay; weak, coarse, subangular blocky structure; firm; patchy clay films on peds; common, fine and medium, dark-brown and black concretions and dark-brown stains; 15 percent, by volume, fragments of chert 1 to 3 inches in size; strongly acid.

The A1 horizon is dark-brown, dark yellowish-brown, or very dark grayish-brown silt loam or loam. It is 5 to 10 inches thick.

The B horizon is strong-brown, reddish-brown, or brown silt loam or silty clay loam. It is about 5 to 15 percent chert, by volume.

Dolomitic limestone bedrock is at a depth of more than 6 feet.

CeC—Claiborne silt loam, 5 to 12 percent slopes. This is a deep, sloping, well-drained, loamy soil on broad tops of high ridges. It is underlain by cherty dolomitic limestone. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of strongly sloping Claiborne soils and a few areas of soils that have a surface layer of brown cherty silt loam and a subsoil of yellowish-red cherty silty clay loam and clay. Also included are a few areas of soils that have a surface layer of dark-brown, friable silt loam and a friable, sticky subsoil of dark-red silty clay loam and clay.

This soil is well suited to all crops grown in the area. It is well suited to use as homesites and to other engineering uses. The steepness of slope limits this soil for some uses. Capability unit IIIe–1; woodland suitability group 3o7.

CeD—Claiborne silt loam, 12 to 25 percent slopes. This is a deep, loamy, moderately steep, well-drained soil. It is predominantly in areas of east-facing slopes on high ridges and is underlain by cherty dolomitic limestone.

The surface layer is dark-brown or dark yellowish-brown silt loam or loam and is about 5 to 9 inches thick.

The subsoil is strong-brown or reddish-brown silt loam or silty clay loam in the upper part and is yellowish-red, reddish-brown, or red silty clay loam and clay in the lower part. Bedrock is at a depth of more than 6 feet. Chert fragments, by volume, are 5 to 15 percent of the profile.

Included with this soil in mapping are a few small areas of soils that have a surface layer of brown cherty silt loam and small areas of severely eroded soils that have a surface layer of silty clay loam. Also included are a few areas of soils that have a surface layer of dark-brown, friable silt loam and a subsoil of friable, sticky, dark-red silty clay loam and of clay.

This soil is suited to all crops commonly grown in the survey area. Slope is the main limitation to its use. It is very well suited to pasture. Capability unit IVe–1; woodland suitability group 3o7.

CeE—Claiborne silt loam, 25 to 40 percent slopes. This is a deep, loamy, steep soil on the sides of high dolomitic limestone ridges. Most areas slope to the east or northeast.

The surface layer is dark-brown silt loam 5 to 8 inches thick. The subsoil is reddish-brown, strong-brown, or yellowish-red silty clay loam that grades to clay in the lower part. Bedrock is at a depth of more than 10 feet.

Included with this soil in mapping are a few small areas where old gullies have been revegetated. Also included are some areas of soils that have a surface layer of dark-brown silt loam and a subsoil of dark-red, sticky but friable silty clay loam or clay. Some small, severely eroded areas of soils have a surface layer of silty clay loam. Chert fragments make up about 20 percent of the profile, by volume, in some places.

This soil is suited to such uses as pasture and timber production. Good volunteer stands of poplar are in some long-abandoned fields. Capability unit VIe–1; woodland suitability group 3r8.

CfE3—Claiborne soils, 15 to 35 percent slopes, severely eroded. These are deep, moderately steep, well-drained soils in small, severely eroded areas on hillsides. Most of the areas were once row cropped but are now reverting to forest (fig. 8). A few shallow and deep gullies are in each area.

Figure 8.—**Wooded area of moderately steep, severely eroded Claiborne soils.**

The surface layer is strong-brown or dark-brown, friable silt loam or silty clay loam 4 to 6 inches thick. The subsoil is reddish-brown, strong-brown, or yellowish-red silty clay loam that grades to clay in the lower part. Dolomitic limestone bedrock is at a depth of more than 10 feet.

Included with these soils in mapping are a few spots that eroded somewhat less in the past and that have a surface layer of dark-brown silt loam 6 to 10 inches thick. In some places small areas of a soil that has a subsoil of dark-red, sticky but friable clay several feet thick are also included.

These soils are better suited to timber production than to most other uses. However, if existing gullies are stabilized and further damage from erosion is prevented, good pastures can be established. Such treatment is expensive and may not be economically feasible. Good stands of yellow-poplar and, in some places, Virginia pine volunteer in some old fields. Additional trees can be planted to help stabilize gullies. Capability unit VIe–1; woodland suitability group 3r8.

Clarksville Series

The Clarksville series consists of cherty, deep, well-drained soils on narrow ridge crests and steep, west-facing slopes. The soils formed in residuum from cherty dolomitic limestone. They are commonly called gravelly ridgeland. Slopes range from 5 percent to about 40 percent.

In a representative profile the surface layer is pale-brown and light yellowish-brown cherty silt loam about 12 inches thick. The upper 19 inches of the subsoil is brownish-yellow and yellowish-brown cherty silty clay loam. Below this is reddish-yellow cherty silty clay loam several feet thick. Dolomitic limestone bedrock is at a depth of more than 6 feet.

Permeability is moderate to moderately rapid, and available water capacity is low. Reaction is strongly acid or very strongly acid. The soils are somewhat difficult to work because of their chert content and steep slopes, but adapted crops respond fairly well to good management.

Most of the acreage of Clarksville soils is in woods. Small patches of corn, small grain, and tobacco are grown. Some areas are used for pasture.

Representative profile of Clarksville cherty silt loam, 5 to 20 percent slopes:

Ap—0 to 7 inches, pale-brown (10YR 6/3) cherty silt loam; weak, fine, granular structure; friable; 40 to 50 percent, by volume, angular chert fragments; very strongly acid; abrupt, smooth boundary.

A2—7 to 12 inches, light yellowish-brown (10YR 6/4) cherty silt loam; weak, fine and medium, granular structure; friable; about 50 percent, by volume, angular chert fragments; very strongly acid; clear, smooth boundary.

B1—12 to 22 inches, brownish-yellow (10YR 6/6), cherty silty clay loam; weak, fine, subangular blocky structure; friable; about 50 percent, by volume, angular chert fragments; very strongly acid; clear, smooth boundary.

B21t—22 to 31 inches, yellowish-brown (10YR 5/6) cherty silty clay loam; weak and moderate, medium, subangular blocky structure; firm; thin continuous clay films on faces of peds and on faces of fine chert fragments; about 60 percent angular chert fragments; very strongly acid; clear, smooth boundary.

B22t—31 to 42 inches, reddish-yellow (7.5YR 6/6) cherty silty clay loam; weak and moderate, medium, subangular blocky structure; firm; continuous clay films on faces of peds and faces of chert fragments; about 60 percent angular chert fragments; very strongly acid; clear, wavy boundary.

B23t—42 to 63 inches, reddish-yellow (7.5YR 6/6) cherty silty clay loam; moderate, medium, subangular blocky structure; firm; common, fine and medium, strong-brown (7.5YR 5/8) and yellowish-red (5YR 5/8) mottles; thin continuous clay films on faces of peds and finer chert fragments; about 60 percent angular chert fragments; very strongly acid.

Chert content ranges from 35 to 75 percent throughout the profile.

The A horizon is brown, pale-brown, or light yellowish-brown cherty silt loam or cherty loam 8 to 15 inches thick. Where the soils are wooded, the upper 2 or 3 inches of the A horizon is dark grayish brown.

The B horizon is brownish-yellow or yellowish-brown cherty silt loam or cherty silty clay loam in the upper part and yellowish-red, red, strong-brown, or reddish-yellow cherty silty clay loam or cherty clay in the lower part.

Dolomitic limestone is at a depth of more than 6 feet.

CkD—Clarksville cherty silt loam, 5 to 20 percent slopes. This is a deep, cherty soil on and near the tops of high hills and ridges. The areas range from about 3 to 15 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of soils that are nearly free of chert fragments. In a few of the steeper places there are a few outcrops of dolomitic limestone.

Most of the areas of this soil are isolated on the tops of high hills, so they cannot be conveniently used as separate fields. Where the areas are accessible, the soil is fairly well suited to crops such as small grain and tobacco. Droughtiness late in summer is a limitation to crops. This soil is suited to pasture and forests. Capability unit VIe–1; woodland suitability group 3f8.

CkE—Clarksville cherty silt loam, 20 to 40 percent slopes. This is a deep, cherty, steep soil on high hills and ridges. It is mostly on southwest- and west-facing slopes. Areas are 5 to 20 acres in size. This soil is locally called gravelly ridgeland.

The surface layer is brown cherty silt loam about 8 to 12 inches thick. The subsoil is yellowish-brown cherty silt loam in the upper part and reddish-yellow cherty silty clay loam in the lower part. Fragments of chert about 1 to 4 inches in size make up about one-half of the profile by volume. Bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are a few areas of soils that have some outcrops of dolomitic limestone.

Steepness of slope, content of chert fragments, and low available water capacity are concerns of management of this soil. Droughtiness late in summer is a limitation to pasture production, and plant growth is difficult to maintain. A variety of trees grow fairly well in this soil. Capability unit VIIe–1; woodland suitability group 4f3.

Cloudland Series

The Cloudland series consists of loamy and moderately well drained soils that have a fragipan. The soils formed in old alluvial deposits on high terraces of rivers and creeks. Slopes range from 2 to 12 percent.

In a representative profile the surface layer is brown, friable loam about 8 inches thick. The subsoil, to a depth of about 26 inches, is light yellowish-brown, friable loam. Below this is a firm, brittle fragipan that consists of mottled grayish, brownish, and yellowish loam about 24 inches thick. The underlying material, at a depth of 50 inches, is light brownish-gray gravelly clay loam.

Permeability is moderate in the upper part of the profile but slow in the fragipan. Available water capacity is medium. Natural fertility is very low. Reaction is very strongly acid, except where the surface layer has been limed. The soils are easy to work and respond very favorably to management.

Most areas of these soils are used for tobacco, corn, hay, small grain, and pasture. Some areas have been subdivided and are in light industrial and residential developments.

Representative profile of Cloudland loam, 2 to 5 percent slopes:

Ap—0 to 8 inches, brown (10YR 5/3) loam; weak, fine, granular structure; very friable; many roots; few sandstone pebbles; strongly acid; clear, smooth boundary.

A3—8 to 10 inches, pale-brown (10YR 6/3) loam; weak, fine and medium, subangular blocky structure; very friable; many roots; very strongly acid; clear, smooth boundary.

B21—10 to 21 inches, light yellowish-brown (10YR 6/4) loam; weak, fine and medium, subangular blocky structure; very friable; common roots; few sandstone pebbles; very strongly acid; clear, wavy boundary.

B22—21 to 26 inches, light yellowish-brown (10YR 6/4) loam; few, medium, faint, yellowish-brown (10YR 5/6) mottles and distinct, light brownish-gray (10YR 6/2 mottles; weak, medium and fine, angular blocky structure; friable and slightly brittle; few roots; few pebbles; very strongly acid; clear, wavy boundary.

Bx1—26 to 36 inches, pale-brown (10YR 6/3) loam; common, fine to coarse, faint, light brownish-gray (10YR 6/2) mottles and distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and thick, platy structure parting to weak, medium, angular blocky; brittle, firm; few pebbles; very strongly acid; gradual, wavy boundary.

Bx2—36 to 50 inches, pale-brown (10YR 6/3) loam; common, fine to coarse, faint to distinct, light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), and light-gray (10YR 7/1) mottles; weak, medium and thick, platy structure parting to weak, medium, angular blocky; firm and brittle; common vesicular pores; few vertical veins of grayish silty clay; clay flows on some faces of peds and in pores; few pebbles; very strongly acid; gradual, irregular boundary.

IIC—50 to 65 inches, light brownish-gray (2.5Y 6/2) gravelly clay loam; common, medium and coarse, distinct, yellowish-brown (10YR 5/8) and faint, light-gray (10YR 7/1) mottles; weak, coarse, angular blocky structure to massive; firm; very strongly acid.

The Ap horizon is brown, grayish-brown, or yellowish-brown loam, silt loam or, rarely, fine sandy loam. It is 5 to 10 inches thick.

The B2 horizon is yellowish-brown, light yellowish-brown, or brownish-yellow loam. The fragipan is at a depth of 22 to 35 inches.

Shale bedrock is at a depth of more than 5 feet.

CoB—Cloudland loam, 2 to 5 percent slopes. This is a loamy, gently sloping, moderately well drained soil that has a fragipan. It is on broad, old terraces of rivers and creeks. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small pockets of a soil that is mainly gray below the surface layer. A few small areas of a well-drained soil without a fragipan are also included.

This soil is well suited to most locally grown crops. Stands of alfalfa tend to be short-lived because rooting depth is limited and the water table above the fragipan is seasonally high. Slow permeability and a seasonally perched water table are the main concerns of management for all uses. Capability unit IIe–2; woodland suitability group 3o7.

CoC—Cloudland loam, 5 to 12 percent slopes. This is a loamy, sloping, moderately well drained soil that has a fragipan. This soil is on old high stream terraces.

The surface layer is brown, friable loam about 8 inches thick. The subsoil, to a depth of about 2 feet, is yellowish-brown, friable loam. Below this is a mottled, firm, brittle fragipan.

Included with this soil in mapping are a few severely eroded spots of soils that have a surface layer of yellowish-brown loam. Also included are a few pockets of a soil that is mainly gray below the surface layer.

This soil is fairly well suited to most locally grown crops, but stands of alfalfa may be somewhat short-lived. Slope, slow permeability, and a seasonally perched water table above the fragipan are the main concerns of management for both farming and engineering uses. Capability unit IIIe–5; woodland suitability group 3o7.

Cynthiana Series

The Cynthiana series consists of clayey, shallow soils on highly dissected ridges, commonly on the lower slopes of mountains, where they formed in material weathered from interbedded calcareous shale and limestone. They are littered with limestone flagstones and shale fragments. Slopes are 5 to 50 percent.

In a representative profile the surface layer is brown flaggy silty clay loam about 5 inches thick. The subsoil is yellowish-brown and brown flaggy silty clay. Bedrock is at a depth of about 17 inches. Fragments make up about 20 to 30 percent, by volume, of the profile.

Permeability is moderately slow, and available water capacity is low. Reaction is slightly acid to mildly alkaline. Cynthiana soils respond poorly to management.

Cynthiana soils are in native pasture, and about half the acreage is in forest of mixed hardwoods and redcedar. In a few areas the flagstones have been removed from the surface and improved pasture has been established.

Representative profile of Cynthiana flaggy silty clay loam, 5 to 20 percent slopes:

Ap—0 to 5 inches, brown (10YR 4/3) flaggy silty clay loam; moderate, medium, subangular blocky structure; friable; common roots; about 20 percent, by volume, flagstones of limestone and fragments of shale; neutral; clear, wavy boundary.

B2t—5 to 14 inches, yellowish-brown (10YR 5/4) flaggy silty clay; moderate, medium, subangular blocky structure; firm; common roots; about 30 percent, by volume, limestone flagstones and shale fragments; clay films on faces of peds; neutral; clear, wavy boundary.

C—14 to 17 inches, brown (10YR 5/3) flaggy silty clay; massive; fragments of shale part along bedding planes; about 30 percent, by volume, limestone flagstones and shale fragments; mildly alkaline.

R—17 inches, limestone interbedded with calcareous shale.

Coarse fragments make up about 15 to 35 percent, by volume, of the profile.

The A horizon is brown or yellowish-brown flaggy silty clay loam or flaggy silty clay. It is 3 to 8 inches thick.

The B horizon is brown, yellowish-brown, or strong-brown flaggy silty clay or flaggy clay.

Bedrock is at a depth of about 10 to 20 inches.

CyD—Cynthiana flaggy silty clay loam, 5 to 20 percent slopes. This sloping to moderately steep soil is on hilltops and low hillsides. It is underlain by interbedded calcareous shale and limestone. It has the profile described as representative of the series.

The surface layer is brown flaggy silty clay loam 4 to 8 inches thick. The subsoil is yellowish-brown flaggy silty clay. Bedrock is at a depth of 10 to 20 inches.

Included with this soil in mapping are a few small areas of severely eroded soils and a few areas that have somewhat steeper slopes. Also included are a few areas of soils that are very similar to this Cynthiana soil but are about 25 inches deep to bedrock. A few also have a few narrow ledges that are outcrops of bedrock.

This soil is only fairly well suited to pasture or trees. Shallow depth and clayey texture are limitations to plant growth, even where flagstones do not prevent mowing and tillage. Only drought-tolerant species can survive dry spells in summer on this soil. Capability unit VIIs–1; woodland suitability group 4x3.

CyE—Cynthiana flaggy silty clay loam, 20 to 50 percent slopes. This is a steep, shallow, clayey soil on dissected hillsides. It is underlain by interbedded calcareous shale and limestone.

The surface layer is brown flaggy silty clay loam 3 to 6 inches thick. The subsoil is yellowish-brown, brown, or strong-brown flaggy silty clay. Bedrock is at a depth of 10 to 20 inches.

Included with this soil in mapping are small, severely eroded areas and a few spots where soils are deeper than 20 inches to bedrock. A few small tracts have piles of flagstones on the surface.

This soil is better suited to adapted trees such as eastern redcedar, but in some areas fair grazing is provided by native grasses, including common bermudagrass and bluegrass. Steep slopes and stones are concerns of management. Capability unit VIIs–1; woodland suitability group 4x3.

Dandridge Series

The Dandridge series consists of shallow, shaly, excessively drained soils on steep, highly dissected hills and ridges. The soils formed in material weathered from calcareous shale. They are locally called black slate land. Slopes range from 5 percent to about 60 percent but are dominantly 20 to 60 percent.

In a representative profile the surface layer is dark grayish-brown shaly silty clay loam about 6 inches thick. The next layer is yellowish-brown shaly silty clay about 10 inches thick over hard shale bedrock.

Permeability is moderately slow, and available water capacity is very low. Reaction is slightly acid to mildly alkaline; the soils do not require lime. Dandridge soils are difficult to work but are fairly responsive to good management.

Dandridge soils are used mainly for pasture, but small patches of corn, hay, and tobacco are also grown. About one-fourth of the acreage is in woods.

Representative profile of Dandridge shaly silty clay loam, 5 to 20 percent slopes:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) shaly silty clay loam; moderate and strong, medium, granular structure; friable; many fine roots; 20 percent, by volume, shale fragments; neutral; clear, wavy boundary.

B—6 to 16 inches, yellowish-brown (10YR 5/4) shaly silty clay; moderate, medium, subangular blocky structure; firm; common fine roots; 45 percent, by volume, fragments of calcareous shale; neutral; clear, wavy boundary.

R1—16 to 20 inches, fractured calcareous shale; few thin coatings of brownish clayey soil material on shale fragments and in seams extending into cracks.

R2—20 inches, hard, calcareous shale bedrock.

The Ap horizon is dark grayish-brown, brown, or yellowish-brown shaly silt loam or shaly silty clay loam. In wooded areas the A horizon is dark grayish-brown shaly silt loam about 2 inches thick.

The B horizon is yellowish-brown, strong-brown, or olive-brown shaly silty clay loam or shaly silty clay.

Shale bedrock is at a depth of 6 to 20 inches.

DaD—Dandridge shaly silty clay loam, 5 to 20 percent slopes. This soil is mainly on the tops of high hills. It formed from calcareous shale that is locally called black slate or blue slate. Hard shale rock is at a depth of about 6 to 20 inches. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of soils that have a severely eroded surface layer of shaly silty clay, and a few areas that have a surface layer of shaly silt loam. Also included are a few nearly level spots of soils, on hilltops, that have a fragipan.

This soil is fairly well suited to pasture and some hay crops. Plants usually grow well during the spring when moisture is plentiful, but they grow very slowly in the drier summer season. Some areas of this soil are in those parts of the county undergoing urban expansion. This soil is neither deep enough nor permeable enough for septic tank disposal systems to function properly. Capability unit VIe–3; woodland suitability group 4d3.

DaE—Dandridge shaly silty clay loam, 20 to 35 percent slopes. This is a steep soil on the sides of rounded hills. Hard shale rock is at a depth of about 6 to 20 inches.

The surface layer is brown shaly silty clay loam 4 to 6 inches thick. The subsoil is yellowish-brown shaly silty clay. Fragments of soft and hard shale 1 to 5 inches in length make up nearly one-half of the profile.

Included with this soil in mapping are some very small areas of a soil that is 20 to 30 inches deep and has a yellowish-red subsoil. Also included are a few spots where nearly all of the soil has slipped off, exposing the shaly rock.

This soil is fairly well suited to pasture. Pasture plants such as tall fescue, bluegrass, and lespedeza grow well in spring and early in summer. Droughtiness is a limitation to pasture growth. Because of droughtiness, pastures are highly susceptible to overgrazing. The soil is well suited to forests. Capability unit VIe–3; woodland suitability group 4d3.

DaF—Dandridge shaly silty clay loam, 35 to 60 percent slopes. This is a very steep soil on side slopes of the dissected shale hills. Some of the areas are bluffs adjacent to creeks. Calcareous shale rock is at a depth of about 5 to 20 inches. Fragments of shale are throughout the profile.

The surface layer is brown shaly silty clay loam 4 to 6 inches thick. The subsoil is yellowish-brown shaly silty clay that extends to the bedrock.

Included with this soil in mapping are a few spots of a soil that is 20 to 30 inches deep to rock and has yellowish-red subsoil. In a few places the bedrock is sandy shale and the soil is loam.

Practically all of the areas of this soil are in forest; the soil is better suited to this use than to most other uses. Capability unit VIIe–1; woodland suitability group 4d3.

Decatur Series

The Decatur series consists of deep, dark-red, well-drained soils on low hills in limestone valleys. The soils formed either in deep, noncherty limestone residuum or in old alluvium. Slopes range from 5 percent to about 20 percent.

In a representative profile the surface layer is dark reddish-brown silt loam about 8 inches thick. The upper 7 inches of the subsoil is dark reddish-brown silty clay loam. Below this, and to a depth of several feet, is dark-red clay. Limestone bedrock is at a depth of more than 6 feet.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid or very strongly acid except where the surface layer has been limed. The soils are fairly easy to work and respond well to good management.

Decatur soils are used for corn, tobacco, small grain, hay, and pasture (fig. 9). They are highly productive and are very well suited to small grain, hay, and pasture.

Representative profile of Decatur silt loam, 5 to 12 percent slopes:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/2) silt loam; weak, medium, granular structure; friable; many medium and fine roots; medium acid; abrupt, smooth boundary.

B1—8 to 15 inches, dark reddish-brown (2.5YR 3/4) silty clay loam; moderate, fine, subangular blocky structure; friable; many medium and fine roots; medium acid; clear, smooth boundary.

B21t—15 to 20 inches, dark-red (2.5YR 3/6) clay; moderate, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; continuous clay films; few, soft, dark-brown concretions; strongly acid; gradual, smooth boundary.

Figure 9.—Pasture in area of Decatur soils.

B22t—20 to 38 inches, dark-red (10YR 3/6) clay; moderate, medium and coarse, subangular blocky structure; firm, sticky and plastic; continuous clay films; few, fine, brown concretions; strongly acid; gradual, smooth boundary.

B23t—38 to 60 inches, dark-red (10R 3/6) clay; dark reddish brown (2.5YR 3/4), crushed; moderate, medium and coarse, subangular blocky structure; firm, sticky and plastic; continuous clay films; few, fine, brown concretions; strongly acid; gradual, smooth boundary.

B24t—60 to 72 inches, dark-red (2.5YR 3/6) clay; weak, coarse, subangular blocky structure; firm, sticky and plastic; continuous clay films; common, fine, brown concretions; strongly acid.

The Ap horizon is dark reddish-brown or dark-red silt loam, silty clay loam, or, rarely, loam. It is 4 to 10 inches thick.

The B horizon is dark-red, dark reddish-brown, or dusky-red silty clay loam, silty clay, or clay several feet thick.

Limestone is at a depth of more than 6 feet.

DcC—Decatur silt loam, 5 to 12 percent slopes. This is a deep, well-drained soil on low rolling hilltops in limestone valleys. The soil has the profile described as representative of the series. It is in areas of 2 to 15 acres.

The surface layer is dark reddish-brown silt loam about 4 to 7 inches thick. The subsoil is dark-red clay several feet thick. Limestone bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are some small, more eroded areas of soils that have a surface layer of silty clay loam and clay. In some of these areas the surface layer is dark red. Also included are a few small areas where slopes range from 2 to 5 percent.

This soil is well suited to all crops adapted to the climate. Crops growing on this soil respond excellently to management. This soil is also well suited to use as homesites and to most other uses. Capability unit IIIe–2; woodland suitability group 3o7.

DcD—Decatur silt loam, 12 to 20 percent slopes. This is a deep, moderately deep, well-drained, reddish soil. It is on sides of low-lying hills in the smoother limestone valleys. It is in areas of 2 acres to about 15 acres.

The surface layer is dark reddish-brown silt loam about 5 to 7 inches thick. The subsoil is dark-red clay many feet thick. Limestone rock is at a depth of more than 6 feet.

Included with this soil in mapping are a few small places where the surface layer is silty loam or clay because severe erosion has removed the original silt loam surface layer. These places are small spots within larger areas. Also included are a few small areas of soils that have a surface layer of dark-brown silt loam and a subsoil of red silty clay or clay, and a few areas where slopes are steeper than 20 percent.

This soil is fairly well suited to all commonly grown crops. It is especially well suited to hay and pasture. Slope is the main limitation to use for crops as well as to most other uses. Capability unit IVe–1; woodland suitability group 3o7.

Dewey Series

The Dewey series consists of deep, reddish, well-drained soils on low hills in limestone valleys. The soils formed in limestone residuum that is covered in most places by a thin layer of old alluvium. Slopes are 5 to 20 percent.

In a representative profile the surface layer is dark reddish-brown silt loam about 8 inches thick. Below this, to a depth of 24 inches, is dark-red clay that is underlain by several feet of red clay.

Permeability is moderate, and available water capacity is medium. Reaction is strongly acid, except where the surface layer has been limed. The soils are easy to work and respond very well to good management.

Dewey soils are used for corn, small grain, tobacco, hay, and pasture. A few areas are in small farm woodlots.

Representative profile of Dewey silt loam, 5 to 12 percent slopes:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/4) silt loam; weak, fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

B1—8 to 13 inches, dark-red (2.5YR 3/6) clay; moderate, medium, subangular blocky structure; friable; common, fine, black concretions; strongly acid; clear, smooth boundary.

B21t—13 to 24 inches, dark-red (2.5YR 3/6) clay; moderate, medium, subangular blocky structure; firm; patchy clay films; common, fine, black concretions; strongly acid; clear, smooth boundary.

B22t—24 to 72 inches, red (2.5YR 4/6) clay; few, fine and medium, strong-brown (7.5YR 5/6) mottles; moderate, medium and fine, subangular blocky structure; firm; continuous clay films; strongly acid.

The Ap horizon is dark-brown, reddish-brown, dark-red, or dark reddish-brown silt loam, loam, or silty clay loam. It is 5 to 10 inches thick.

The B1 horizon is dark-red, reddish-brown, or red clay or silty clay loam. It is not present in some places.

The B2t horizon is dark-red clay or silty clay loam in the upper 2 feet. Below this it is red or yellowish-red clay.

Limestone bedrock is at depth of more than 6 feet.

DeC—Dewey silt loam, 5 to 12 percent slopes. This is a deep, reddish, well-drained soil. It is mainly on the tops of low-lying hills in areas ranging from about 2 to 15 acres in size. It formed in a thin layer of old alluvium and in the underlying residuum from limestone. The soil has the profile described as representative of the series.

The surface layer is dark reddish-brown silt loam 8 inches thick. The subsoil is reddish clay several feet thick. Limestone bedrock is at a depth of more than 6 feet. Most areas have a few spots where erosion has exposed the reddish clayey subsoil. These spots give the land surface a mottled appearance.

Included with this soil in mapping are a few small areas of a soil that has a surface layer of yellowish-brown silt loam and a subsoil of yellowish-red clay. Also included are some areas of a soil that is similar to this Dewey soil, but the upper part of the subsoil is yellowish-red clay loam 1 to 2 feet thick. Small, more eroded spots of soils that have a surface layer of silty clay loam and clay are also included.

This soil is suited to all plants adapted to the climate. These include row crops, hay crops, and pasture. Slope is the main concern of management for crop production. This soil is also well suited to use as homesites and to other engineering uses. Capability unit IIIe–2; woodland suitability group 3o7.

DeD—Dewey silt loam, 12 to 20 percent slopes. This is a deep, moderately steep, well-drained, reddish soil on hillsides in limestone valleys. Some of the areas are pitted by limestone sinks.

The surface layer is dark reddish-brown silt loam 4 to 7 inches thick, and the subsoil is dark-red and red clay several feet thick. Limestone rock is at a depth of more than 6 feet.

Included with this soil in mapping are a few areas of a soil that has numerous fragments of chert. Also included are small areas of soils that have a surface layer of red clay. Some areas of soils have an upper subsoil layer of yellowish-red clay loam 1 or 2 feet thick.

This soil is well suited to all plants adapted to the climate. It is better suited to hay and pasture than to most other crops.

Strong slope is the main concern of management for crops as well as for most other uses. Capability unit IVe–1, woodland suitability group 3o7.

Dunmore Series

The Dunmore series consists of deep, well-drained soils on low hills in limestone valleys. In many places there are sinks and depressions. The soils formed in dolomitic limestone residuum. Slopes are 5 to 35 percent.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The upper part of the subsoil is strong-brown, firm silty clay loam 4 inches thick. The rest is yellowish-red, firm clay many feet thick. Dolomitic limestone bedrock is at a depth of more than 6 feet, and in some places it is at a depth of as much as 50 feet.

Permeability is moderate, and available water capacity is medium. Reaction is strongly acid and very strongly acid, except where the surface layer has been limed. The soils are fairly easy to work and respond very well to good management.

Dunmore soils are used for corn, tobacco (fig. 10), small grain, hay, and pasture, but the largest part of the acreage is used for pasture. Some tracts are in small farm woodlots.

Representative profile of Dunmore silt loam, 5 to 12 percent slopes:

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—7 to 11 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B21t—11 to 36 inches, yellowish-red (5YR 5/6) clay; strong, medium, subangular blocky structure; firm, plastic; continuous clay films; strongly acid; gradual, smooth boundary.

B22t—36 to 50 inches, yellowish-red (5YR 5/8) clay; common, medium, yellowish-brown (10YR 5/6) mottles; strong, medium, subangular blocky structure; firm, plastic; continuous clay films; very strongly acid; gradual, smooth boundary.

B3—50 to 65 inches, yellowish-red (5YR 5/8) clay; many medium, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; firm, plastic; thick, continuous clay films; very strongly acid.

Chert makes up from 0 to 10 percent, by volume, of the profile.

The Ap horizon is brown or yellowish-brown silt loam or loam 5 to 10 inches thick. It is strong-brown or yellowish-red silty clay loam or clay in severely eroded places.

The B1 horizon, where present, is dark yellowish-brown, strong-brown, or yellowish-red silt loam, loam, or silty clay loam. It is 3 to 6 inches thick. The B2t horizon is yellowish-red or red clay.

Limestone is at a depth of more than 6 feet.

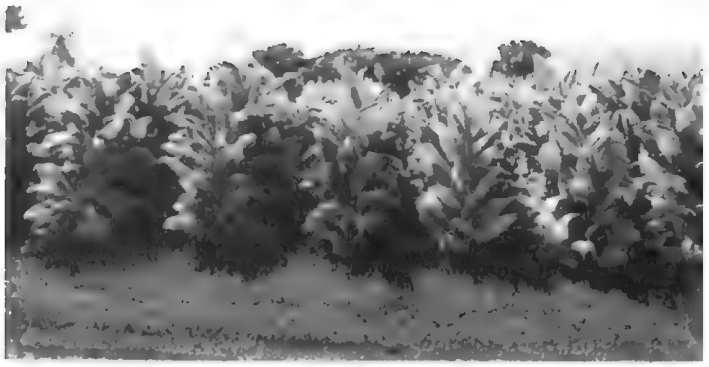

Figure 10.—Tobacco in an area of Dunmore silt loam, 5 to 12 percent slopes.

DnC—Dunmore silt loam, 5 to 12 percent slopes. This soil is on the tops of low-lying hills and on short upland slopes. Areas are 3 to 10 acres. Some areas surround shallow depressions and limestone sinks. The soil, which is many feet thick, formed in material derived from dolomitic limestone. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few areas of soils that have a surface layer of dark-brown silty clay loam and a few that have a clay surface layer of yellowish-red. Also included are small areas of soils in depressions and along drainageways. These soils are dark-brown silt loam to a depth of 2 feet or more.

This soil is suited to row crops, small grain, hay, and pasture. Slope is the main concern of management for crops as well as for other uses, such as building sites. A part of the acreage is located in those parts of the county undergoing urban expansion. The soil is moderately well suited to this use. Capability unit IIIe–2; woodland suitability group 3o7.

DnD—Dunmore silt loam, 12 to 20 percent slopes. This is a deep, well-drained, moderately steep soil in areas on short upland slopes. Some areas are deeply pitted by limestone sinks and depressions.

The surface layer is brown silt loam, and the subsoil is yellowish-red, firm and plastic clay. Dolomitic limestone bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are a few eroded areas of soils that have a surface layer of yellowish-red clay and a few small areas that have numerous fragments of chert. Also included are small areas of a soil in sinks and along narrow, crooked drainageways. These areas consist of brown silt loam to a depth of 2 feet or more. In a few places, especially along the base of slopes, there are some outcrops of limestone.

This soil is well suited to small grain, hay, and pasture. Row crops should be grown in a cropping system that uses a long rotation or other conservation measures. Moderately steep slope is the main concern of management. Capability unit IVe–1; woodland suitability group 3o7.

DnE—Dunmore silt loam, 20 to 35 percent slopes. This is a steep soil on sides of moderately high hills in the major limestone valleys. Some areas form the rims around limestone sinks. Areas are 5 to 25 acres.

The surface layer is brown silt loam about 4 to 8 inches thick. The subsoil is yellowish-red, firm, plastic clay several feet thick. The lower part is mottled with yellow and brown. Dolomitic limestone rock is at a depth of more than 6 feet.

Included with this soil in mapping are a few small areas of soils that have numerous chert pebbles on the surface and throughout the profile, a few areas of soils that have a yellowish-red clayey surface layer, and small areas of soils that are similar to Dunmore soils but have a somewhat redder subsoil. A few areas on hillsides where slopes are steeper than 35 percent are also included. In a few places, particularly near the base of slopes, there are some outcrops of limestone.

This soil is fairly well suited to pasture. It is well suited to all pasture plants adapted to the climate. It is well suited to trees. Capability unit VIe–1; woodland suitability group 3r8.

DoD—Dunmore silty clay loam, 12 to 25 percent slopes. This is a deep, moderately steep, well-drained soil on sides of low hills. In some places it surrounds limestone sinks. It is in areas of 2 acres to about 5 acres.

The surface layer is yellowish-red silty clay loam about 5 inches thick. The subsoil is yellowish-red, firm, plastic clay several feet thick. Dolomitic limestone bedrock is at a depth of more than 6 feet.

A few of the areas have gullies 2 to 3 feet deep and 10 to 40 feet apart. Between the gullies the surface layer is silty clay loam or clay.

Included with this soil in mapping are a few areas of soils that have numerous fragments of chert and a few that have outcrops of limestone.

This soil is poorly suited to row crops. It is better suited to permanent sod crops. Slope and the clayey surface layer are the main concerns of management. Capability unit VIe–1; woodland suitability group 4c3e.

Dunning Series

The Dunning series consists of dark-colored, clayey, poorly drained, nearly level soils on bottom lands. These soils are typically away from the stream channel and near the base of steep upland slopes. They are underlain by shale. The soils formed in fine-textured alluvium.

In a representative profile the surface layer is very dark gray silty clay loam about 16 inches thick. The subsoil is mottled, dark-gray, very firm silty clay. Below this, and to a depth of 46 inches, is mottled dark-gray, grayish-brown, and light olive-brown silty clay. Mottled yellowish-brown, light olive-brown, and grayish-brown silty clay loam is between this layer and shale bedrock, which is at a depth of 60 inches.

Permeability is very slow, and available water capacity is medium. Reaction is slightly acid to mildly alkaline. The water table is at or near the surface in winter and in spring. The soils are difficult to work but respond fairly well to surface drainage and other management practices. Most areas are subject to occasional, brief flooding.

These soils are used for corn, hay crops, and pasture.

Representative profile of Dunning silty clay loam:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; weak, medium, subangular blocky structure parting to moderate, medium and fine, granular; friable, slightly sticky and slightly plastic; many roots; neutral; clear, wavy boundary.

A1—8 to 16 inches, very dark gray (10YR 3/1) silty clay loam; common, fine, faint, grayish-brown and dark grayish-brown mottles; weak, medium, subangular blocky structure; friable; common roots; slightly acid; clear, wavy boundary.

B2g—16 to 32 inches, dark-gray (10YR 4/1) silty clay; many, fine and medium, dark grayish-brown (10YR 4/2) and very dark gray (10YR 3/1) and common, fine, yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; very firm, sticky and plastic; few roots; neutral; clear, wavy boundary.

C1g—32 to 46 inches, mottled grayish-brown (2.5Y 5/2), light olive-brown (2.5Y 5/6), and dark-gray (10YR 4/1) silty clay; massive; very firm, sticky and plastic; few roots; mildly alkaline; gradual, wavy boundary.

C2g—46 to 60 inches, mottled yellowish-brown (10YR 5/4), light olive-brown (2.5Y 5/6), and grayish-brown (2.5Y 5/2) silty clay loam; massive; stick and plastic; mildly alkaline; common, fine, black concretions.

R—60 inches, shale bedrock.

The A horizon is very dark grayish-brown, very dark gray, or black silty clay loam or silty clay 10 to 20 inches thick. Shale bedrock is at a depth of 4 to 6 feet or more.

Du—Dunning silty clay loam. This is a poorly drained, clayey soil on bottom lands. It is away from the stream channel and at the edge of the bottoms adjacent to steep uplands on which the soils are underlain by shale. It is subject to occasional, brief flooding. Areas are 2 to 20 acres.

Included with this soil in mapping are small areas of soils that are slightly better drained than this Dunning soil. Also included are a few small areas of soils covered with 6 to 12 inches of recently deposited overwash of brown silt loam.

This soil is suited to crops that can be planted late, such as soybeans, and to plants that tolerate wetness, such as tall fescue. Surface drainage can improve plant growth where suitable outlets are available. Capability unit IIIw–1; woodland suitability group 2w9.

Ealy Series

The Ealy series consists of deep, loamy, well-drained soils in narrow strips along creeks that drain watersheds comprised mainly of sandstone, siltstone, and shale. Slopes range from 0 to 2 percent.

In a representative profile the surface layer is brown loam 6 inches thick. The subsoil is dark yellowish-brown, very friable loam 10 inches thick. Below this is dark yellowish-brown loam and fine sandy loam to a depth of 68 inches.

Permeability is moderately rapid, and available water capacity is high. Reaction is strongly acid, except where the surface layer has been limed. The soils respond quite well to good management, but they are subject to occasional, brief flooding.

Most areas of the Ealy soils are used for pasture, hay, and some corn and small grain.

Representative profile of Ealy loam:

Ap—0 to 6 inches, brown (10YR 4/3) loam; weak, medium and fine, granular structure; very friable; many roots; medium acid; clear, smooth boundary.

B2—6 to 16 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium and fine, subangular blocky and granular structure; very friable; many roots; about 5 percent, by volume, fragments of sandstone up to 3 inches across; strongly acid; clear, smooth boundary.

C1—16 to 19 inches, brown (10YR 5/3) loamy fine sand; structureless; loose; common fine roots; strongly acid; abrupt, smooth boundary.

C2—19 to 42 inches, dark yellowish-brown (10YR 4/4) loam; massive or weak, medium, subangular blocky structure; very friable; few fine roots; few pebbles of sandstone; strongly acid; clear, smooth boundary.

C3—42 to 55 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; massive; very friable; few fine roots; few pebbles of sandstone; strongly acid; clear, smooth boundary.

C4—55 to 68 inches, grayish-brown (10YR 5/2) fine sandy loam; common, medium and coarse, distinct, yellowish-brown (10YR 5/4) mottles; massive; very friable; few pebbles of sandstone; strongly acid.

The Ap horizon is brown or dark grayish-brown loam or fine sandy loam 6 to 11 inches thick.

The C horizon in some areas has gray mottles below a depth of about 25 inches.

Shale or siltstone bedrock is at a depth of about 5 to 6 feet.

Ea—Ealy loam. This is a deep, nearly level, well-drained, loamy soil in narrow strips along the channels of Poor Valley and Beech Creeks.

Included with this soil in mapping are a few areas of soils that have gray mottles below a depth of about 15 to 20 inches. Also included are a few small spots of soils that have thin beds of gravel in the lower part.

This soil is well suited to most commonly grown crops. Occasional, brief flooding is the main limitation to most uses. Capability unit I–1; woodland suitability group 2o7.

Emory Series

The Emory series consists of deep, loamy, well-drained soils along small drainageways and in depressions. The soils formed in sediment washed from red soils of the limestone uplands. Slopes range from 2 to about 5 percent.

In a representative profile the surface layer is dark-brown silt loam about 7 inches thick. The upper part of the subsoil is reddish-brown, friable silty clay loam 10 inches thick. The lower part is dark reddish-brown, friable silt loam 11 inches thick. The underlying material is dark-brown silt loam that is 5 inches thick over brown and mottled brown loam.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid and medium acid, except where the surface layer has been limed. The soils are highly productive and are responsive to good management.

Emory soils are used for tobacco, corn, hay, and pasture. They are well suited to use as homesites where infrequent flooding or runoff from upland slopes can be prevented.

Representative profile of Emory silt loam:

Ap—0 to 7 inches, dark-brown (7.5YR 3/2) silt loam; moderate, medium and fine, granular structure; friable; many roots; slightly acid; clear, smooth boundary.

B11—7 to 17 inches, reddish-brown (5YR 4/4) silty clay loam; weak, fine, subangular blocky structure; friable; common roots; many fine pores; medium acid; clear, smooth boundary.

B12—17 to 28 inches, dark reddish-brown (5YR 3/4) silt loam; weak, medium, subangular blocky structure; friable; common fine pores; few, small, angular chert pebbles; strongly acid; clear, smooth boundary.

A1b—28 to 33 inches, dark-brown (7.5YR 3/2) silt loam containing common, fine, reddish-brown and dark grayish-brown mottles; weak, medium and fine, granular structure; friable; few roots; few, fine, angular chert fragments; medium acid; clear, smooth boundary.

C1—33 to 37 inches, brown (10YR 4/3) loam; common, fine, dark-brown and dark grayish-brown mottles; weak, medium, granular structure; friable; few, fine, angular chert fragments; strongly acid; clear, wavy boundary.

C2—37 to 53 inches, mottled yellowish-brown (10YR 5/4), grayish-brown (10YR 5/2), and dark grayish-brown (10YR 4/2) loam; weak, medium, subangular blocky structure; friable; few fine chert pebbles; common, fine, black concretions; strongly acid.

The Ap horizon is dark reddish-brown or dark-brown silt loam or loam.

The B horizon is dark reddish-brown or reddish-brown silt loam or silty clay loam.

The A1b horizon is dark-brown or dark reddish-brown silt loam or loam.

Limestone bedrock is at a depth of more than 6 feet.

Em—Emory silt loam. This is a deep, well-drained, highly productive soil on small benches or foot slopes along small drainageways and in depressions. Slopes are 2 to 5 percent.

Included with this soil in mapping are a few small areas of soils where the surface layer is brown and the subsoil is yellowish-red clay loam. Also included are a few small areas of cherty soils.

This soil is very well suited to most uses. It is well suited to all locally grown crops. It is well suited to use as homesites where protection from infrequent flooding or diversion of runoff water is feasible. Capability unit I–1; woodland suitability group 2o7.

Etowah Series

The Etowah series consists of deep, well-drained, loamy soils at the base of steeper slopes in the limestone valleys. These soils formed in material that washed or drifted downslope from reddish soils derived from limestone. Slopes range from 2 to 25 percent.

In a representative profile the surface layer is dark-brown, friable silt loam about 9 inches thick. The subsoil is reddish-brown, friable silty clay loam to a depth of 36 inches. Below this is several feet of red silty clay loam and clay. Limestone bedrock is at a depth greater than 6 feet.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid, except where the surface layer has been limed. The soils are easy to work and respond very well to good management.

Etowah soils are very well suited to most uses. They are used for corn (fig. 11), tobacco, small grain, hay, and pasture. A large acreage is in areas of active urban expansion.

Representative profile of Etowah silt loam, 2 to 5 percent slopes:

Ap—0 to 9 inches, dark-brown (7.5YR 3/2) silt loam; moderate, medium, granular structure; very friable; many roots; medium acid; clear, smooth boundary.

B1—9 to 18 inches, reddish-brown (5YR 4/4) silty clay loam; weak, medium, subangular blocky structure; friable; common roots; patchy clay films; strongly acid; gradual, smooth boundary.

B21t—18 to 36 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium and fine, subangular blocky structure; friable; discontinuous clay films; few roots; few, fine, black concretions; strongly acid; gradual, smooth boundary.

B22t—36 to 50 inches, red (2.5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; firm; continuous clay films; few small chert fragments; strongly acid; gradual, smooth boundary.

B23t—50 to 72 inches, red (2.5YR 4/8) clay; strong, coarse, subangular blocky structure; firm; continuous clay films; strongly acid.

The Ap horizon is dark-brown or dark reddish-brown silt loam or loam. It is about 7 to 12 inches thick.

The upper 2 feet or more of the B horizon is strong-brown, brown, or reddish-brown silty clay loam or clay loam. The lower part is reddish-brown, yellowish-red, or red silty clay loam, clay loam, or clay.

Limestone bedrock is at a depth of more than 6 feet.

Figure 11.—**Corn, which has been partly harvested, in an area of Etowah silt loam. Lehew soils are on ridge in background.**

EtB—Etowah silt loam, 2 to 5 percent slopes. This is a deep, gently sloping, well-drained, productive soil on benches in the limestone valleys. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of soils that have a surface layer of brown cherty silt loam and a subsoil of yellowish-red cherty silty clay loam. Also included are a few acres of brown loamy soils along small drainageways.

This soil is highly productive. It is well suited to all commonly grown crops. It is very well suited to use as homesites. Capability unit IIe–1; woodland suitability group 2o7.

EtC—Etowah silt loam, 5 to 12 percent slopes. This is a deep, sloping, well-drained, productive soil on benches and foot slopes in the limestone valleys.

The surface layer is dark-brown, friable silt loam about 5 to 9 inches thick. The subsoil is reddish-brown silty clay loam to a depth of about 3 feet. Below this is reddish silty clay loam or clay several feet thick.

Included with this soil in mapping are a few small areas of soils that are 10 to 15 percent, by volume, chert gravel, and a few areas where the surface layer is brown and the subsoil is yellowish red. Also included are a few strips of brown loamy soils along drainageways.

This soil is well suited to all locally grown crops. It is also very well suited to use as homesites and to other nonfarm uses. Slope is the main concern of management for most uses. Capability unit IIIe–1; woodland suitability group 2o7.

EtD—Etowah silt loam, 12 to 25 percent slopes. This is a deep, productive soil on benches and foot slopes near the base of higher hills on which are reddish soils that formed in material derived from limestone.

The surface layer is dark-brown silt loam about 6 to 10 inches thick. The upper part of the subsoil is reddish-brown, friable silty clay loam, and the lower part is reddish silty clay loam or silty clay. Bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are a few areas of soils containing chert gravel. Also included are a few spots of soils where the surface layer has been removed by erosion and a few areas of somewhat steeper soils.

This soil is suited to all commonly grown crops, especially hay and pasture, but long rotations or other conservation measures are needed to control erosion when row crops are grown. Strong slope is the main limitation to use of this soil for row crops, as well as for most other uses. Capability unit IVe–1; woodland suitability group 2o7.

Fullerton Series

The Fullerton series consists of deep, cherty, well-drained soils on the high ridges of dolomitic limestone (fig. 12). Slopes range from 5 to 35 percent.

Figure 12.—**Fullerton and Clarksville soils on smooth ridge in background.**

In a representative profile the surface layer is brown cherty silt loam about 9 inches thick. The next layer is light yellowish-brown cherty silt loam 4 inches thick. The upper part of the subsoil is strong-brown cherty silty clay loam to a depth of 23 inches. Below this is several feet of yellowish-red and red, firm cherty clay. Dolomitic limestone bedrock is at a depth of more than 6 feet and in places is at a depth of as much as 50 feet.

Permeability is moderate, and available water capacity is medium. Reaction is strongly acid or very strongly acid throughout the profile, except where the surface layer has been limed. The soils are fairly easy to work, and the less sloping soils respond favorably to management.

Fullerton soils are used mainly for hay and pasture, but a few areas are in tobacco, corn, and small grain. A large part of the steeper areas is in hardwood forest.

Representative profile of Fullerton cherty silt loam, 5 to 12 percent slopes:

Ap—0 to 9 inches, brown (10YR 5/3) cherty silt loam; weak, medium, granular structure; very friable; about 15 percent, by volume, angular chert gravel; many roots; strongly acid; clear, smooth boundary.

A2—9 to 13 inches, light yellowish-brown (10YR 6/4) cherty silt loam; weak, medium, granular structure; very friable; many roots; many fine pores; about 15 percent chert gravel; strongly acid; clear, wavy boundary.

B21t—13 to 23 inches, strong-brown (7.5YR 5/6) cherty silty clay loam; common coarse streaks of yellowish red (5YR 4/6); weak, medium, subangular blocky structure; friable; common roots; common fine pores; 20 percent chert cobbles and gravel; strongly acid; clear, wavy boundary.

B22t—23 to 34 inches, yellowish-red (5YR 4/8) cherty clay; moderate, medium and fine, angular blocky structure; firm; continuous clay films on most peds and chert faces; few roots; 20 percent chert; strongly acid; gradual, irregular boundary.

B23t—34 to 72 inches, red (2.5YR 4/8) cherty clay; common medium streaks of strong brown; strong, medium, angular blocky structure; firm; continuous clay films; 20 percent chert; strongly acid.

Angular chert fragments, mostly 1 to 3 inches in diameter, commonly make up 15 to 25 percent, by volume, of the profile, but their content ranges from 15 to 35 percent.

The Ap horizon is brown or dark grayish-brown cherty silt loam or loam 6 to 10 inches thick. The A2 horizon is brown, yellowish brown, or light yellowish brown and ranges from 0 to 10 inches in thickness.

The upper part of the B horizon is yellowish-red, strong-brown, or reddish-yellow cherty silty clay loam or cherty clay loam. The lower part is red or yellowish-red cherty clay.

FnC—Fullerton cherty silt loam, 5 to 12 percent slopes. This is a deep, well-drained, cherty soil on the rounded crests of high ridges of dolomitic limestone. The soil formed in material weathered from similar rock. It has the profile described as representative of the series.

Included with this soil in mapping are a few areas of soils that have more than 35 percent chert throughout the profile. Also included are a few spots of Fullerton soils that have stronger slopes. Depressional areas of soils less than 1 acre in size are also included.

This soil is suited to all crops grown in the survey area. Drought late in summer is a frequent hazard to row crops. In most places the chert fragments are small enough and few enough not to significantly impede tillage or mowing. This soil is well suited to use as homesites and to other nonfarm uses. Many of the areas are isolated on the tops of hills, where it is impractical to use them as separate fields. Capability unit IIIe–3; woodland suitability group 3o7.

FnD—Fullerton cherty silt loam, 12 to 20 percent slopes. This is a deep, well-drained, cherty soil. It is on long hillsides that are mainly on the south faces of high ridges of dolomitic limestone.

The surface layer is brown cherty silt loam 6 to 10 inches thick. The upper part of the subsoil is yellowish-red cherty silty clay loam, and the lower part is yellowish-red or red cherty clay. The subsoil is many feet thick. Dolomitic limestone is at a depth of more than 6 feet.

Included with this soil in mapping are a few small areas of soils that are slightly cherty and a few areas that are very cherty. Also included are a few spots of eroded soils that have a surface layer of yellowish-brown cherty silt loam. Some narrow bands of steeper Fullerton soils bordering sinkholes are also included.

This soil is well suited to all sod crops used locally for hay and pasture. Slope is the main concern of management for row crops and for most other uses. Droughtiness late in summer limits yields, particularly of row crops. Capability unit IVe–2; woodland suitability group 3o7.

FnE—Fullerton cherty silt loam, 20 to 35 percent slopes. This is a well-drained, deep, cherty, steep soil. It is in areas on long, south-facing slopes of high ridges and hills of dolomitic limestone.

The surface layer is brown or yellowish-brown cherty silt loam 5 to 10 inches thick. The subsoil is reddish cherty silty clay loam grading to cherty clay at a depth of 2 feet or more. Bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are a few areas that have very little chert. Also included are a few areas of very cherty soils, a few areas of soils that have very steep slopes, and a few strips of soils that have scattered bedrock outcrops.

Because it is steep, this soil is poorly suited to row crops. It is fairly well suited to pasture. Slope is the main limitation to farming as well as to most other uses. Capability unit VIe–1; woodland suitability group 3r8.

Gilpin Series

The Gilpin series consists of steep, moderately deep, loamy, well-drained soils in areas on north-facing slopes of high, linear siltstone ridges. Slopes range from about 25 to 50 percent.

In a representative profile the surface layer is brown silt loam about 6 inches thick. The next layer is light yellowish-brown, very friable silt loam 6 inches thick. The subsoil is yellowish-brown, friable shaly silty clay loam. Siltstone bedrock is at a depth of about 30 inches.

Permeability is moderate, and available water capacity is low. Reaction is strongly acid or very strongly acid.

Gilpin soils are in hardwood forest.

Representative profile of Gilpin silt loam, 25 to 50 percent slopes:

A1—0 to 1 inch, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; very friable; many roots; strongly acid; abrupt, wavy boundary.

A2—1 to 6 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; very friable; many roots; 10 percent siltstone fragments; very strongly acid; clear, wavy boundary.

B1—6 to 12 inches, light yellowish-brown (10YR 6/4) silt loam; moderate, fine and medium, subangular blocky structure; very friable; common roots; 10 percent siltstone fragments; very strongly acid; gradual, wavy boundary.

B2t—12 to 24 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable; few roots; patchy clay films; 15 percent siltstone fragments; very strongly acid; gradual, wavy boundary.

B3—24 to 30 inches, yellowish-brown (10YR 5/6) light shaly silty clay loam; weak, medium, subangular blocky structure; friable; few patchy clay films, mostly on rock fragments; 25 percent coarse fragments; very strongly acid.

R—30 inches, partly weathered siltstone bedrock.

Siltstone, shale, and fine sandstone fragments make up 15 to 30 percent of the profile.

The A horizon is 4 to 8 inches thick.

Bedrock of acid siltstone or shale is at a depth of 1½ to 3 feet.

GpF—Gilpin silt loam, 25 to 50 percent slopes. This is a moderately deep, very steep, loamy soil on north faces of siltstone ridges. It is almost inaccessible except to hunters and hikers.

Included with this soil in mapping are a few small areas of shaly soils that have acid shale bedrock at a depth of about 16 inches. Also included are a few outcrops of bedrock. In some places the soil has been disturbed as a result of windthrow.

This soil is poorly suited to most uses. Suitability is fair to good for adapted species of trees and for some recreational uses. Capability unit VIIe–1; woodland suitability group 3r8.

Greendale Series

The Greendale series consists of deep, loamy, well-drained soils along small drainageways or local flood plains and in depressions. The soils formed in sediment washed from soils derived from dolomitic limestone. Slopes range from 0 to about 5 percent.

In a representative profile the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is dark yellowish-brown, dark-brown, and yellowish-brown friable silt loam to a depth of 56 inches. Below this is several feet of reddish clay. A few, small, angular chert fragments are throughout the profile.

Permeability is moderate, and available water capacity is high. Reaction is medium acid and strongly acid, except where the surface layer has been limed. The soils are easy to work and respond very favorably to good management. Some areas are subject to occasional, very brief flooding or runoff from adjacent slopes, which is the main concern of management.

Greendale soils are used for corn, tobacco, small grain, hay, and pasture.

Representative profile of Greendale silt loam:

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; weak, medium, granular structure; friable; many roots; 10 percent, by volume, chert fragments up to 2 inches in size; medium acid; clear, smooth boundary.

B21—9 to 22 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; common roots; 10 percent, by volume, chert fragments up to 2 inches in size; medium acid; clear, smooth boundary.

B22—22 to 28 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; few fine roots; 5 percent, by volume, chert fragments up to 3 inches in size; strongly acid; clear, wavy boundary.

A1b—28 to 34 inches, dark-brown (10YR 3/3) silt loam; moderate, medium, granular structure; friable; few fine roots; about 10 percent, by volume, chert frag-

ments up to 2 inches in size; strongly acid; clear, smooth boundary.

Bb—34 to 56 inches, yellowish-brown (10YR 5/4) silt loam; few, medium, distinct, pale-brown (10YR 6/3), light brownish-gray (10YR 6/2), and dark-brown (10YR 3/3) mottles; weak, medium, subangular blocky structure; friable; 15 percent, by volume, chert fragments up to 3 inches in size; strongly acid.

Chert gravel makes up about 3 to 15 percent, by volume, of the profile.

The Ap horizon is brown or dark grayish-brown silt loam or loam 5 to 10 inches thick.

The B horizon is yellowish-brown or dark yellowish-brown silt loam, loam, or silty clay loam.

The A1b horizon, where present, is commonly below a depth of 20 to 40 inches.

Limestone bedrock is at a depth of more than 6 feet.

Gr—Greendale silt loam. This is a loamy, well-drained soil in narrow strips along local drainageways and in small depressions. Some areas are subject to occasional, very brief flooding or runoff from upland slopes. Slopes are 0 to 5 percent.

Included with this soil in mapping are a few narrow strips of soils mottled with gray at a depth of about 15 or 20 inches. Also included are a few small areas of a soil that has a fragipan in the lower part of the subsoil.

This soil is well suited to all crops commonly grown in the survey area. It is not well suited to use as homesites, because there is some hazard of flooding. Capability unit I–1; woodland suitability group 2o7.

Guthrie Series

The Guthrie series consists of poorly drained, gray soils in flat or slightly depressional areas of the old river terraces. The soils formed in old, general alluvial deposits. Slopes range from 0 to 2 percent.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. Below this is about 18 inches of light-gray silt loam and silty clay loam that has yellowish and brownish mottles. A fragipan extends from 25 to 65 inches and is mottled light-gray, firm silt loam.

Permeability is slow, and available water capacity is medium. Runoff is slow. Reaction is strongly acid and very strongly acid, except where the surface layer has been limed. The water table is near the surface in winter and early in spring. These soils have a fair response to management.

Most areas of these soils are used for pasture, but some areas have been drained and are used for silage, corn, and hay.

Representative profile of Guthrie silt loam:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable; many roots; medium acid; clear, smooth boundary.

A21g—7 to 11 inches, light-gray (10YR 7/1) silt loam; common, medium, brownish-yellow (10YR 6/6) mottles; weak, medium and fine, granular structure; friable; few roots; many fine pores; strongly acid; clear, wavy boundary.

A22g—11 to 17 inches, light-gray (10YR 7/1) silt loam; common, medium, brownish-yellow (10YR 6/6) mottles; weak, medium, subangular blocky structure; friable; few fine pores; common light-gray streaks of silt; very strongly acid; gradual, wavy boundary.

A&B—17 to 25 inches, light-gray (10YR 7/1) silt loam and silty clay loam; common, medium, brownish-yellow (10YR 6/6) and pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure grading to massive; friable; few fine pores; very strongly acid; clear, wavy boundary.

Bx1—25 to 35 inches, light-gray (10YR 7/1) silt loam; common, medium and fine, olive-yellow (2.5Y 6/6) mottles; weak, coarse, prismatic structure grading to massive; firm, brittle; few remnants of brownish-yellow (10YR 6/6) silty clay loam; discontinuous clay films; very strongly acid; gradual, irregular boundary.

Bx2—35 to 65 inches, mottled light-gray (10YR 7/1), light olive-brown (2.5Y 5/6), and olive-yellow (2.5Y 6/6) silt loam; weak, coarse, prismatic structure; firm, hard, brittle; common remnants of brownish-yellow (10YR 6/6) silty clay loam; light-gray silt coatings and grayish clay films on faces of prisms; very strongly acid; gradual, wavy boundary.

The Ap horizon is grayish-brown, gray, or brown silt loam or loam. It is 6 to 10 inches thick. Depth to the top of the fragipan ranges from about 20 to 35 inches. About 1 or 2 feet of cobbly clay or sandy clay overlies shale bedrock in places.

Bedrock is at a depth of more than 6 feet.

Gu—Guthrie silt loam. This is a gray, poorly drained soil in nearly level or slightly depressional areas on old river terraces. It formed in old alluvial deposits from these rivers. Seasonal ponding is common in many areas. Slopes are 0 to 2 percent.

Included with this soil in mapping are a few areas of a poorly drained soil that is clayey in the lower part of the subsoil and that lacks a fragipan. Also included are a few small areas of slightly better drained soils.

This soil is poorly suited to crops that are not tolerant of a wet rooting zone and ponded conditions in winter and early in spring. Where adequate surface drainage is provided, it is fairly well suited to pasture, hay, and late summer silage. It has severe limitations for most engineering uses. Capability unit IVw–1; woodland suitability group 2w9.

Hamblen Series

The Hamblen series consists of loamy, moderately well drained soils on bottom lands along creeks and branches. The soils formed in recent sediment washed from soils over limestone, shale, and siltstone. Slopes are 0 to 2 percent.

In a representative profile the surface layer is brown silt loam about 8 inches thick. The subsoil is dark yellowish-brown, friable silt loam about 9 inches thick. Below this is mottled, brown silt loam and loam. Shale bedrock is at a depth of 52 inches.

Permeability is moderate, and available water capacity is high. Reaction is slightly acid, medium acid, or neutral. The soils are easy to work and respond very favorably to good management, but they are subject to occasional, brief flooding.

Hamblen soils are used for pasture, hay, and some corn.

Representative profile of Hamblen silt loam:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; moderate, medium and fine, granular structure; very friable; many roots; neutral; clear, smooth boundary.

B2—8 to 17 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; many roots; slightly acid; clear, smooth boundary.

B3—17 to 33 inches, brown (10YR 4/3) silt loam; many, medium and fine, grayish-brown (10YR 5/2), very dark grayish-brown (10YR 3/2), and pale-brown (10YR 6/3) mottles; weak, medium, subangular

blocky structure; friable; common roots; few shale fragments; slightly acid; clear, smooth boundary.
C—33 to 52 inches, brown (10YR 4/3) stratified silt loam and loam; many, medium and fine, grayish-brown (10YR 5/2), very dark grayish-brown (10YR 3/2), and dark-brown (7.5YR 3/2) mottles; weak, medium, subangular blocky structure; friable; few roots; slightly acid.
R—52 inches, shale bedrock.

The A horizon is brown, yellowish-brown, dark yellowish-brown, or dark grayish-brown silt loam or loam 5 to 11 inches thick.
Bedrock is at depth of 3½ to 6 feet.

Ha—Hamblen silt loam. This is a moderately well drained, loamy soil on bottom lands of creeks and their small tributaries. Slopes range from 0 to 2 percent.

Included with this soil in mapping are a few small areas of poorly drained soils. Also included are narrow strips of well-drained soils adjacent to the stream channels.

This soil is well suited to corn, hay, and pasture. Flooding is the main concern of management. Capability unit IIw–1; woodland suitability group 2w8.

Hartsells Series

The Hartsells series consists of moderately deep, loamy, well-drained soils on the upper southeast-facing slopes and on the tops of the higher ridges and mountains. The soils formed in material weathered from the sandstone that caps ridges and mountains. Slopes range from about 3 to 20 percent.

In a representative profile the surface layer is yellowish-brown loam about 7 inches thick. The subsoil is yellowish-brown, friable clay loam and sandy clay loam. Partly weathered fragments of sandstone are in the 6-inch layer of fine sandy loam just above the bedrock. Sandstone bedrock is at a depth of 38 inches.

Permeability is moderate, and available water capacity is medium. Natural fertility is very low. Reaction is strongly acid or very strongly acid. The soils are easy to work and respond fairly well to management.

Many of the areas of Hartsells soils have been abandoned and are reverting to forest, but a few areas are used for small plots of corn, hay, and pasture. A few areas are still in hardwood and pine forest.

Representative profile of Hartsells loam, 3 to 12 percent slopes:

Ap—0 to 7 inches, yellowish-brown (10YR 5/4) loam; weak, fine, granular structure; very friable; many roots; very strongly acid; clear, smooth boundary.
B1—7 to 13 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, medium, granular structure; friable; common roots; very strongly acid; clear, smooth boundary.
B2t—13 to 32 inches, yellowish-brown (10YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; friable; discontinuous clay films; common roots; few angular sandstone fragments in lower part; very strongly acid; gradual, smooth boundary.
B3&C—32 to 38 inches, yellowish-brown (10YR 5/6) channery sandy clay loam; weak, coarse, subangular blocky structure and remnant rock structure; friable; few roots; 30 percent sandstone fragments; few patchy clay films on rock fragments; very strongly acid.
R—38 inches, sandstone bedrock.

The A horizon is yellowish-brown, brown, or pale-brown loam or fine sandy loam. In wooded areas the A horizon is grayish brown or dark grayish brown and is about 2 inches thick.
The B horizon is yellowish-brown or brownish-yellow sandy clay loam, loam, or clay loam and ranges to fine sandy loam in the upper few inches.
Sandstone bedrock is at a depth of 20 to 40 inches.

HeC—Hartsells loam, 3 to 12 percent slopes. This is a loamy, sloping, moderately deep soil on crests and benches of sandstone mountains. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of gravelly soils that have bedrock at a depth of about 16 inches. Also included are a few spots of soils that are deeper than 40 inches to bedrock or have a surface layer of clay loam because of past erosion.

This soil is fairly well suited to pasture, hay, and small grain. Many areas, atop the mountains, are practically inaccessible, but they are suited to planned recreational developments. The soil has very low natural fertility. Available water capacity, permeability, and other physical properties are favorable for plant growth. Thus, many kinds of plants respond well to fertilization and other good management practices. Droughtiness late in summer is a limitation to use for row crops. Capability unit IIIe–1; woodland suitability group 4o1.

HeD—Hartsells loam, 12 to 20 percent slopes. This is a moderately deep, loamy, well-drained soil that is mainly in areas on south-facing slopes of high sandstone-capped ridges and mountains.

The surface layer is brown loam about 4 to 6 inches thick. The subsoil is yellowish-brown, friable sandy clay loam or clay loam. Sandstone bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of gravelly soils that have sandstone bedrock at a depth of 15 to 20 inches. A few areas of slightly steeper soils are also included.

This soil is well suited to many kinds of plants. These plants respond well to additions of fertilizer and lime. Many areas are almost inaccessible except on foot. The soil has very low natural fertility. Available water capacity, permeability, and other physical properties are favorable for plant growth. Depth to rock, strong slope, and low fertility are the main limitations to use. Droughtiness late in summer is a limitation to use for most crops. Capability unit IVe–1; woodland suitability group 4o1.

Hayter Series

The Hayter series consists of deep, loamy, well-drained soils on sloping fans, benches, and foot slopes. The soils are also on long, steep, north-facing back slopes of mountains (fig. 13). They formed in material that rolled or washed downslope from soils that formed in material weathered from siltstone and shale. These soils are underlain mainly by limestone. Slopes range from 3 to 55 percent.

In a representative profile the surface layer is dark-brown, friable loam about 7 inches thick. Below this is dark yellowish-brown loam about 5 inches thick. The subsoil is strong-brown and yellowish-red, friable clay loam to a depth of 55 inches. Yellowish-red and strong-brown loam extends to a depth of 67 inches.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid or medium acid, except where the surface layer has been limed. The soils are easy to work and respond very favorably to good management.

The Hayter soils are used for corn, tobacco, small grain,

Figure 13.—**Area of Hayter soils on long, moderately steep slopes in middle background.**

hay, and pasture. Some of the steeper areas are in forest.

Representative profile of Hayter loam, 12 to 20 percent slopes:

Ap—0 to 7 inches, dark-brown (10YR 4/3) loam; weak, fine, granular structure; very friable; many roots; few siltstone and sandstone pebbles; slightly acid; clear, wavy boundary.

A3—7 to 12 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium, subangular blocky structure parting to moderate, medium, granular; friable; many roots; few siltstone and sandstone fragments; medium acid; clear, smooth boundary.

B21t—12 to 29 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium, subangular blocky structure; friable; common patchy clay films; few roots; few siltstone and sandstone fragments; medium acid; clear, smooth boundary.

B22t—29 to 45 inches, yellowish-red (5YR 5/6) clay loam containing common coarse streaks of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; friable; thin patchy clay films; about 15 percent, by volume, sandstone and siltstone fragments; medium acid; gradual, smooth boundary.

B3—45 to 55 inches, yellowish-red (5YR 5/6) clay loam; weak, medium, granular structure; friable; estimated 20 percent coarse fragments; medium acid; clear, wavy boundary.

C—55 to 67 inches, yellowish-red (5YR 5/6) and strong-brown (7.5YR 5/6) loam; massive; friable; estimated 50 percent sandstone fragments; slightly acid.

The profile is as much as 50 percent, by volume, cobbles and gravel in places.

The Ap horizon is dark-brown, dark yellowish-brown, or brown loam or silt loam. It is 5 to 10 inches thick.

The B horizon is strong-brown, brown, reddish-brown, or yellowish-red clay loam.

Limestone is at a depth of more than 6 feet. Yellowish mottled clay weathered from limestone or interbedded limestone and shale is at a depth of 40 to 75 inches.

HhC—Hayter loam, 3 to 12 percent slopes. This is a deep, loamy, sloping, highly productive soil. It is on benches, fans, and foot slopes along the northern base of mountains and high ridges. It formed in material that rolled or washed downslope from soils that formed over siltstone and shale.

The surface layer is dark-brown friable loam about 9 inches thick. The subsoil is strong-brown, friable clay loam to a depth of 4 feet or more. Below this is yellowish or reddish clay weathered from the underlying limestone or shale.

Included with this soil in mapping are a few small areas that have gray mottles below a depth of about 30 inches. Also included are a few areas, along drainageways, that have a brown loamy profile, and a few areas of soils that are 10 to 20 percent gravel throughout the profile.

This soil is well suited to all locally grown crops. It is very well suited to tobacco. Slope is the main concern of management. Capability unit IIIe-1; woodland suitability group 2o7.

HhD—Hayter loam, 12 to 20 percent slopes. This is a deep, loamy, strongly sloping, friable soil on north-facing benches and foot slopes of the mountains. It formed in material that rolled or washed downslope from soils that are underlain by shale and siltstone. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of red clayey soils and a few outcrops of limestone. Also included are a few areas of soils that are about 15 to 30 percent siltstone and sandstone cobbles and gravel.

This soil is well suited to all commonly grown crops. Long crop rotations, contour cultivation, or other effective measures are needed to control erosion. Slope is the main

concern of management for both farm and nonfarm uses. Capability unit IVe–1; woodland suitability group 2o7.

HhE—Hayter loam, 20 to 35 percent slopes. This is a deep, loamy, steep, productive soil on north-facing mountain back slopes.

The surface layer is dark-brown, friable loam 5 to 8 inches thick. The subsoil is strong-brown, friable clay loam 2½ to 5 feet thick.

Included with this soil in mapping are some areas of soils that are about 20 to 30 percent, by volume, sandstone and siltstone fragments. Also included are a few small areas of red clayey soils and a few outcrops of limestone.

This soil is well suited to pasture and hardwood timber. Slope is the main concern of management. Capability unit VIe–1; woodland suitability group 2r8.

HkD—Hayter cobbly loam, 10 to 20 percent slopes. This is a deep, loamy, moderately steep, well-drained soil on north-facing mountain back slopes. It formed in material that rolled from steeper, higher slopes.

The surface layer is dark-brown, friable cobbly loam 4 to 8 inches thick. The subsoil is strong-brown cobbly clay loam 2½ to 5 feet thick. Sandstone and siltstone cobbles and gravel make up 15 to 30 percent of the soil volume throughout the profile.

Included with this soil in mapping are small areas of noncobbly soils. Also included are a few small areas of shallow clayey soils over shale.

This soil is well suited to pasture, and it is highly productive. It is only fairly well suited to hay and row crops. Strong slopes and the cobbly surface layer are limitations to mowing and cultivation. Capability unit IVe–1; woodland suitability group 2o7.

HkE—Hayter cobbly loam, 20 to 35 percent slopes. This is a deep, friable, steep, well-drained soil in areas on north-facing back slopes of the sandstone and siltstone mountains and high ridges.

The surface layer is dark-brown, friable cobbly loam 4 to 8 inches thick. The subsoil is strong-brown, cobbly clay loam about 2 to 4 feet thick. Cobbles and gravel of sandstone and siltstone make up about 15 to 30 percent of the profile, by volume.

Included with this soil in mapping are a few areas of soils that have loose boulders on the surface. Also included are a few areas of shallow, shaly soils and small spots of rocky, red, clayey soils. Slopes exceed 35 percent in some places.

This soil is fairly well suited to pasture. It is well suited to the better species of hardwoods, including black walnut and yellow-poplar. Steep slopes and stones in the surface layer are the main concerns of management for most uses. Capability unit VIe–1; woodland suitability group 2r8.

HkF—Hayter cobbly loam, 35 to 55 percent slopes. This is a deep, well-drained, very steep, cobbly soil in areas on mostly north-facing mountain back slopes. Most areas are wooded.

The surface layer is dark-brown, friable cobbly loam. It is 5 to 10 inches thick. The subsoil is strong-brown cobbly clay loam about 2 to 4 feet thick. Cobbles, gravel, and small boulders of sandstone make up about 20 to 35 percent of the profile.

Included with this soil in mapping are several small areas that extend down steep drainageways. Small sandstone boulders and cobbles make up about 35 to 60 percent of the surface and of the profile. Also included are a few areas of shallow shaly soils.

Most areas are wooded. This soil is well suited to black walnut and yellow-poplar. Very steep slopes and stones limit this soil to such uses as timber production and wildlife habitat. Capability unit VIIe–1; woodland suitability group 2r8.

Holston Series

The Holston series consists of deep, loamy, well-drained soils on old high river terraces. These soils formed in mixed river sediment deposited in thick layers over shale bedrock. Slopes range from about 2 to 20 percent.

In a representative profile the surface layer is brown, friable loam 8 inches thick. The next layer is very pale brown, very friable loam 3 inches thick. The subsoil is yellowish-brown, strong-brown, and brownish-yellow clay loam to a depth of about 60 inches. Below this is mottled brown, yellowish, and reddish clay loam and loam.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid or very strongly acid, except where the surface layer has been limed. The soils are very easy to work and respond very favorably to management.

Holston soils are used for corn, small grain, hay, tobacco, and pasture. A few small areas are still in hardwood timber. Many large areas have been removed from farm production in recent years to provide sites for industry and for housing subdivisions.

Representative profile of Holston loam, 2 to 5 percent slopes:

Ap—0 to 8 inches, brown (10YR 5/3) loam; weak, fine, granular structure; very friable; many roots; strongly acid; clear, smooth boundary.

A2—8 to 11 inches, very pale brown (10YR 7/4) loam; weak, medium, granular structure; very friable; common roots; strongly acid; clear, smooth boundary.

B1—11 to 23 inches, yellowish-brown (10YR 5/8) clay loam; weak, medium, subangular blocky structure; friable; common roots; patchy clay films; very strongly acid; clear, smooth boundary.

B21t—23 to 32 inches, strong-brown (7.5YR 5/8) clay loam; moderate, medium, subangular blocky structure; friable; patchy clay films; very strongly acid; clear, smooth boundary.

B22t—32 to 48 inches, brownish-yellow (10YR 6/6) clay loam; moderate, medium, subangular blocky structure; firm; discontinuous clay films; few, small, black concretions; very strongly acid; clear, smooth boundary.

B23t—48 to 60 inches, brownish-yellow (10YR 6/6) clay loam; moderate, medium, subangular blocky structure; firm; common, medium, faint, strong-brown and distinct, yellowish-red mottles; common, small, black concretions; discontinuous clay films; very strongly acid; clear, smooth boundary.

B3—60 to 70 inches, mottled brownish-yellow (10YR 6/6), strong-brown (7.5YR 5/6), and yellowish-red (5YR 5/8) coarse clay loam; weak, coarse, subangular blocky structure; firm; common, small, black concretions; very strongly acid; gradual, smooth boundary.

C—70 to 75 inches, mottled brownish-yellow (10YR 6/6), yellowish-brown (10YR 5/6), and reddish-yellow (7.5YR 6/6) loam; massive; loose; some stratification; few partly decomposed sandstone pebbles and cobbles; very strongly acid.

The Ap horizon is brown, yellowish-brown, or pale-brown loam 5 to 10 inches thick. In some places the A2 horizon has been mixed with the A horizon by plowing.

The B horizon is brownish-yellow, yellowish-brown, or

strong-brown clay loam, sandy clay loam, or silty clay loam.

In most areas a 1- or 2-foot thick band of cobbly or gravelly loam or sandy loam is in the lower part of the C horizon, immediately over the clayey, weathered shale bedrock. In some places the C horizon is absent and the B horizon rests directly on shale bedrock.

Shale bedrock is at a depth of more than 6 feet, and in most places is at a depth of more than 10 feet.

HoB—Holston loam, 2 to 5 percent slopes. This is a deep, loamy, gently sloping, well-drained soil on old high river terraces. The soil formed in old, thick alluvial deposits over shale. It has the profile described as representative of the series.

Included with this soil in mapping are a few small depressions containing a soil that has a fragipan below a depth of about 2 feet. Also included are a few tracts where sandstone cobbles and gravel make up 15 to 30 percent of the soil, by volume.

This soil is well suited to all commonly grown crops. It is also well suited to use as homesites, industrial sites, and other nonfarm uses. Capability unit IIe–1; woodland suitability group 3o7.

HoC—Holston loam, 5 to 12 percent slopes. This is a deep, loamy, sloping, well-drained soil on high river terraces. It formed in old, thick alluvial deposits over shale.

The surface layer is brown friable loam about 5 to 10 inches thick. The subsoil is strong-brown or yellowish-brown clay loam or silty clay loam more than 5 feet thick.

Included with this soil in mapping are a few areas of cobbly soils and a few small tracts of deep, reddish soils. Also included are a few small depressions that contain a soil having a fragipan below a depth of 2 feet.

This soil is well suited to all locally grown crops. It is very easy to work and responds extremely well to management. It is also very well suited to use as homesites, industrial sites, and other nonfarm uses. Slope is the main concern of management. Capability unit IIIe–1; woodland suitability group 3o7.

HoD—Holston loam, 12 to 20 percent slopes. This is a deep, loamy, moderately steep, well-drained soil. It is on narrow rims at the edge of broad plateaus on the high river terraces. It formed in old, thick alluvial deposits that are underlain by shale bedrock.

The surface layer is brown friable loam about 4 to 8 inches thick. The subsoil is strong-brown or yellowish-brown clay loam to a depth of 5 feet or more. Below this is 1 to 3 feet of cobbly or gravelly sandy loam overlying clayey, weathered shale bedrock.

Included with this soil in mapping are a few small areas of soils that have shale bedrock within about 3 feet of the surface. Also included are small areas of cobbly soils. In a few places slopes are as steep as about 30 percent.

This soil is fairly well suited to pasture, hay, and locally grown row crops. Slope is the main concern of management. Capability unit IVe–1; woodland suitability group 3o7.

Hx—Holston-Urban land complex. This complex consists mainly of a few large areas of Urban land. Large parts of these areas have been levelled by cutting and filling. Most of the acreage is at the John Sevier Steam Plant and the Holston Ordnance Works reservation. At both sites the original soils were mostly Holston, Cloudland, and some Taft soils. Deep cuts have exposed the underlying calcareous shale bedrock in some spots. Smaller areas were made up of soils of the Dunmore and Shouns series.

This complex is 10 percent undisturbed areas of Holston soils and 90 percent Urban land.

Areas of this complex commonly are nearly level and have narrow, steep margins. They have been compacted. Permeability is very low, and available water capacity is low. Reaction is generally strongly acid, except where the soils have been limed.

Most areas of this complex are used for heavy industrial complexes. They are suited to lawn grasses, landscape shrubbery, and adapted trees. Not assigned to a capability unit or woodland suitability group.

Jefferson Series

The Jefferson series consists of deep, loamy, well-drained soils on benches, fans, and foot slopes (fig. 14). The soils formed in thick colluvial deposits of materials that rolled downslope from sandstone and siltstone mountains. Slopes range from 5 percent to about 35 percent.

In a representative profile the surface layer is brown friable loam 9 inches thick. The subsoil is yellowish-brown clay loam to a depth of 50 inches. Below this is yellowish-brown loam containing many sandstone fragments. Weathered acid shale bedrock is at a depth of 70 inches.

Permeability is moderately rapid, and available water capacity is medium. Reaction is very strongly acid and strongly acid, except where the surface layer has been limed. The soils are naturally low in fertility but respond excellently to liming, fertilization, and other management practices.

Jefferson soils are used for tobacco, hay, corn, and pasture. Much of the steeper acreage is in pine and hardwood forest or is reverting to forest.

Representative profile of Jefferson loam, 5 to 12 percent slopes:

Ap—0 to 9 inches, brown (10YR 5/3) loam; weak, fine, granular structure; very friable; many roots; few sandstone fragments less than 3 inches in diameter; strongly acid; abrupt, smooth boundary.

B1—9 to 15 inches, yellowish-brown (10YR 5/6) clay loam; weak, medium, subangular blocky structure; friable; common roots; few weathered sandstone fragments; strongly acid; clear, smooth boundary.

B21t—15 to 26 inches, yellowish-brown (10YR 5/6) clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films; about 10 percent, by volume, angular sandstone gravel; strongly acid; gradual, smooth boundary.

B22t—26 to 40 inches, yellowish-brown (10YR 5/6) clay loam; moderate, medium, subangular blocky structure; firm; discontinuous clay films; about 15 percent angular sandstone fragments; very strongly acid; gradual, smooth boundary.

B3—40 to 50 inches, yellowish-brown (10YR 5/6) coarse clay loam; weak, medium and coarse, subangular blocky structure; firm; patchy clay films; about 25 percent angular sandstone cobbles and gravel; very strongly acid; clear, wavy boundary.

C—50 to 70 inches, yellowish-brown (10YR 5/4) loam; weak, coarse, subangular blocky structure; friable; about 40 percent angular sandstone cobbles; very strongly acid.

R—70 inches, acid shale bedrock.

The Ap horizon is brown, pale-brown, or grayish-brown loam or, in a few places, fine sandy loam. It is 6 to 10 inches thick.

The B2 horizon is yellowish-brown or strong-brown clay loam or sandy clay loam. Coarse fragments commonly make

Figure 14.—**Area of strongly sloping Jefferson soils on foot slopes, right center.**

up about 8 to 20 percent of the A and B horizons but range to about 30 percent in some profiles.

The C horizon is 25 to 40 percent coarse fragments.

Acid shale or siltstone bedrock is at a depth of more than 5 feet.

JeC—Jefferson loam, 5 to 12 percent slopes. This is a loamy, deep, sloping, well-drained soil on benches and fans near the foot of sandstone and siltstone ridges. It formed in material that washed or rolled from the steeper slopes. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of brown, loamy soils along small, narrow drainageways. In a few depressional spots is a soil that has a fragipan. Small areas of cobbly and gravelly soils are also included. A few areas have slopes of less than 5 percent.

This soil is well suited to all locally grown crops, and it is particularly well suited to tobacco. It responds very well to management. It is well suited to use as homesites, sites for light industry, and other nonfarm uses. Slope is the main concern of management. Capability unit IIIe–1; woodland suitability group 3o7.

JeD—Jefferson loam, 12 to 20 percent slopes. This is a deep, moderately steep, well-drained, brownish soil. It is on benches and foot slopes of the sandstone and siltstone mountains and ridges. It formed in colluvial deposits that rolled or washed from these mountains and ridges.

The surface layer is brown or yellowish-brown loam 4 to 8 inches thick. The subsoil, to a depth of 4 feet or more, is yellowish-brown or strong-brown clay loam or sandy clay loam. Bedrock is at a depth of 5 feet or more.

Included with this soil in mapping are a few small areas of cobbly and gravelly soils. Also included are small areas of less steep Jefferson soils that are on small benches between drainageways, and a few steep banks that are mostly areas undercut by migrating streams.

This soil is well suited to all locally grown crops, but it should be used for sod crops during most years because of slope. It is suitable for hay and pasture. Tobacco can be grown in long rotations with sod crops if the soil is cultivated on the contour, only narrow strips of sod are plowed up, and other effective conservation measures are applied. Prolonged droughtiness during the growing season is a limitation to plant growth, particularly for row crops. Capability unit IVe–1; woodland suitability group 3o7.

JfC—Jefferson cobbly loam, 5 to 12 percent slopes. This is a deep, sloping, well-drained, cobbly soil on benches, fans, and foot slopes of sandstone mountains. The soil formed in cobbly colluvial deposits that accumulated at the bottom of steep mountain slopes.

The surface layer is brown cobbly loam 5 to 10 inches thick. The subsoil is yellowish-brown and strong-brown cobbly clay loam or cobbly sandy clay loam and is more than 4 feet thick. Sandstone and siltstone cobbles and gravel make up 15 to 35 percent, by volume, of the profile. Acid shale or siltstone bedrock is at a depth of 5 to 6 feet or more.

Included with this soil in mapping are small areas of less cobbly soils. Also included are small areas of steeper Jefferson soils.

This soil is suited to all locally grown crops. The cob-

bly plow layer is a limitation to plowing and mowing. In places the surface stones have been picked up and hauled away, thus facilitating tillage and other management practices. The soil is fairly well suited to adapted trees. Droughtiness late in summer is a limitation to row crops. Capability unit IVe–2; woodland suitability group 3x8.

JfD—Jefferson cobbly loam, 12 to 20 percent slopes. This is a cobbly, deep, moderately steep, loamy soil on mountain foot slopes. It formed in colluvial deposits below steep mountainsides.

The surface layer is brown cobbly loam 5 to 9 inches thick. The subsoil is yellowish-brown or strong-brown, cobbly sandy clay loam. Sandstone and siltstone fragments make up 15 to 35 percent, by volume, of the profile. Shale or siltstone bedrock is at a depth of 5 feet or more.

Included with this soil in mapping are small areas of soils that contain sandstone boulders. Also included are a few small areas of shallow soils underlain by shale and siltstone.

This soil is fairly well suited to all locally grown crops, but slope and stones are limitations to tillage and mowing. The soil is fairly well suited to adapted trees. In places this soil is droughty late in summer. Capability unit VIe–1; woodland suitability group 3x8.

JfE—Jefferson cobbly loam, 20 to 35 percent slopes. This is a cobbly, steep, deep, loamy soil on mountainsides. It formed in cobbly material that rolled downslope from steep mountainsides of sandstone and siltstone.

The surface layer is brown cobbly loam 4 to 8 inches thick. The subsoil is yellowish-brown, cobbly sandy clay loam. The profile is 3½ to 5 feet thick. Bedrock is at a depth of 5 feet or more.

Included with this soil in mapping are small areas of somewhat steeper soils and some areas that are nearly free of rock fragments. Also included are a few small areas of shallow soils over shale or siltstone bedrock.

This soil is suited to adapted trees. It is fairly well suited to pasture. Slope and the stones are the main concerns of management. Capability unit VIe–1; woodland suitability group 3x8.

Leadvale Series

The Leadvale series consists of moderately well drained soils that have a fragipan. The soils are on gently sloping and sloping benches, fans, and toe slopes below the dissected shale uplands. They formed in material washed from the slopes of the nearby shale hills. Slopes range from 2 to about 12 percent.

In a representative profile the surface layer is yellowish-brown, friable silt loam about 8 inches thick. Below this, and to a depth of 24 inches, is yellowish, friable silt loam and firm silty clay loam. A brittle fragipan of mottled brownish-yellow, firm silt loam is between depths of 24 to 48 inches. The next layer is mottled, light olive-brown, firm silty clay loam. Shale bedrock is at a depth of 63 inches.

Permeability is slow. Available water capacity is medium. A seasonal water table is perched just above the fragipan in periods of high rainfall. The water moves laterally and breaks out as "wet-weather springs" at the lower margin of these areas. Reaction is strongly acid or very strongly acid throughout the profile, except where the surface layer has been limed. The soils are easy to work and respond fairly well to management.

Leadvale soils are used for corn, small grain, tobacco, hay, and pasture. A few tracts are in small farm woodlots.

Representative profile of Leadvale silt loam, 5 to 12 percent slopes:

Ap—0 to 8 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, granular structure; friable; many roots; medium acid; clear, smooth boundary.

B1—8 to 14 inches, light yellowish-brown (10YR 6/4) silt loam; common, medium, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common roots; common, fine, black concretions; very strongly acid; clear, wavy boundary.

B2t—14 to 24 inches, brownish-yellow (10YR 6/6) light silty clay loam; common, fine, pale-brown (10YR 6/3) mottles; weak, coarse, columnar structure parting to moderate, medium, subangular blocky; firm; common roots; discontinuous clay films; very strongly acid; clear, wavy boundary.

Bx—24 to 48 inches, brownish-yellow (10YR 6/6) silt loam; many, medium, light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), and pale-brown (10YR 6/3) mottles; weak, coarse, columnar structure grading to massive; firm, hard, brittle; patchy clay films; very strongly acid; clear, wavy boundary.

B3—48 to 63 inches, light olive-brown (2.5Y 5/6) silty clay loam; many, fine, light-gray (10YR 7/1) and light brownish-gray (2.5Y 6/2) mottles; massive; firm, plastic; common, fine, dark yellowish-brown stains; few, fine, black concretions; strongly acid.

R—63 inches, shale bedrock.

The Ap horizon is brown, pale-brown, light yellowish-brown, or grayish-brown silt loam 5 to 10 inches thick.

The B2t horizon is yellowish-brown or brownish-yellow silty clay loam. In some places it is mottled with shades of gray in the lower few inches. The B3 horizon (in some places, the C horizon) ranges from silty clay loam to clay.

Shale bedrock is at a depth of about 4 feet or more.

LaB—Leadvale silt loam, 2 to 5 percent slopes. This is a gently sloping, moderately well drained soil. It is on terraces, foot slopes, and benches in areas surrounded by shale hills. It formed in material that washed from the adjacent soils of the shale uplands.

The surface layer is yellowish-brown silt loam 6 to 10 inches thick. The subsoil, to a depth of about 2 feet, is yellowish-brown silty clay loam. Below this is a firm, brittle fragipan about 2 feet thick. It is mottled yellow, gray, and brown, massive silt loam. Shale bedrock is at a depth of 4 to 6 feet.

Included with this soil in mapping are small areas of gray, somewhat poorly drained soils in depressional areas. Also included are young, somewhat poorly drained soils along narrow drainageways.

This soil is fairly well suited to most locally grown crops. During periods of extremely high rainfall, insufficient aeration of the rooting zone damages crops such as tobacco. The fragipan and slow permeability are the main limitations to a number of uses. Capability unit IIe–2; woodland suitability group 3o7.

LaC—Leadvale silt loam, 5 to 12 percent slopes. This is a sloping, moderately well drained soil. It is on toe slopes, benches, and terraces in areas surrounded by upland soils underlain by shale. Slopes are mostly 5 percent to about 10 percent. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of shallow clayey soils underlain by shale. Also included are narrow strips of somewhat poorly drained soils on bottom lands along narrow drainageways.

This soil is fairly well suited to most locally grown crops. The fragipan, slow permeability, and, to a lesser extent, slope are the main concerns of management. Capability unit IIIe–5; woodland suitability group 3o7.

Leesburg Series

The Leesburg series consists of deep, loamy, well-drained soils that formed in thick deposits of old river sediment. Slopes are 10 to 20 percent.

In a representative profile the surface layer is brown gravelly loam about 6 inches thick. The subsoil is mainly yellowish-brown gravelly clay loam to a depth of about 63 inches. Below this is strong-brown silty clay that weathered from shale.

Permeability is moderate, and available water capacity is medium. Reaction is strongly acid or very strongly acid, except where the surface layer has been limed. The soils are fairly easy to work and give fair response to management.

Leesburg soils are used mainly for pasture and hay.

Representative profile of Leesburg gravelly loam, 10 to 20 percent slopes:

Ap—0 to 6 inches, brown (10YR 5/3) gravelly loam; weak, medium, granular structure; very friable; about 15 percent, by volume, quartzite and sandstone gravel; many roots; strongly acid; clear, smooth boundary.

B1—6 to 13 inches, light yellowish-brown (10YR 6/4) gravelly loam; weak, medium, subangular blocky structure; friable; about 15 percent gravel; common roots; strongly acid; gradual, wavy boundary.

B21t—13 to 25 inches, yellowish-brown (10YR 5/6) gravelly clay loam; moderate, medium, subangular blocky structure; friable; about 20 percent gravel and cobbles; few roots; strongly acid; gradual, smooth boundary.

B22t—25 to 63 inches, yellowish-brown (10YR 5/8) gravelly clay loam; few, medium, pale-brown mottles in lower half; moderate, medium, angular and subangular blocky structure; firm; about 20 percent gravel and cobbles; discontinuous clay films on faces of peds; strongly acid; clear, smooth boundary.

B3—63 to 68 inches, strong-brown (7.5YR 5/8) silty clay; common, medium, pale-brown (10YR 6/3) and reddish-brown (5YR 4/4) mottles; moderate, medium, angular blocky structure; firm; discontinuous clay films; few soft shale fragments; strongly acid.

The profile is 15 to 25 percent, by volume, sandstone gravel and cobbles throughout.

The Ap horizon is brown or yellowish brown and is 5 to 9 inches thick.

The B1 horizon, where present, is thin. The B2 horizon is yellowish brown, strong brown, or brownish yellow.

Shale bedrock is at a depth of more than 6 feet.

LbD—Leesburg gravelly loam, 10 to 20 percent slopes. This is a gravelly, deep, strongly sloping, well-drained, loamy soil. It is at the edge of old high river terraces. It formed in old gravelly river sediment underlain by shale bedrock.

Included with this soil in mapping are a few small areas of less gravelly soils. Also included are a few spots of a soil that has a surface layer of yellowish-brown clay loam. In some places the shale bedrock is within a depth of about 3 feet.

This soil is well suited to pasture and hay. Slope is the main concern of management. Capability unit IVe–2; woodland suitability group 3x8.

Lehew Series

The Lehew series consists of channery, moderately deep, excessively drained soils on steep, highly dissected ridges and mountains. The soils formed in material weathered from reddish and multicolored sandstone, siltstone, and shale of the Rome and Bays Formations. Slopes range from about 25 to 60 percent.

In a representative profile the upper 2 inches of the surface layer is stained dark brown with organic matter. The next 6 inches is brown channery loam. Below this, to a depth of 28 inches, is reddish-brown, very friable channery loam. Reddish siltstone and sandstone bedrock are below this depth.

Permeability is moderately rapid, and available water capacity is low. Natural fertility is low. Reaction is strongly acid or very strongly acid, except where the surface layer has been limed.

Small tracts of the Lehew soils are used for pasture, but most of the acreage is in forest.

Representative profile description of Lehew channery loam, 25 to 60 percent slopes:

A1—0 to 2 inches, dark-brown (7.5YR 3/2) channery loam; weak, fine, granular structure; very friable; abrupt, smooth boundary.

A2—2 to 8 inches, brown (7.5YR 4/2) channery loam; weak, medium, granular structure; very friable; many roots; about 30 percent reddish or purplish siltstone and fine-grained sandstone fragments; strongly acid; clear, wavy boundary.

B2—8 to 28 inches, reddish-brown (5YR 4/4) channery loam; weak, fine and medium, subangular blocky structure; very friable; common roots; 50 percent reddish siltstone fragments; strongly acid.

R—28 inches, bedrock of reddish siltstone and fine-grained sandstone with some soil material extending into cracks.

The profile is channery or gravelly loam or fine sandy loam throughout. The content of coarse fragments ranges from about 30 to 50 percent in the upper part of the profile and to as much as 80 percent near the bedrock.

The A1 horizon is dark brown or dark grayish brown and is 1 to 3 inches thick.

Depth to bedrock averages about 25 inches and ranges from 20 inches to about 32 inches.

LeF—Lehew channery loam, 25 to 60 percent slopes. This is a channery, moderately deep, steep and very steep soil on highly dissected ridges and mountains. It formed in material weathered from reddish siltstone and fine-grained sandstone.

Included with this soil in mapping are small areas of soils that have a surface layer of grayish-brown gravelly loam and a subsoil of yellowish-brown gravelly loam. Also included are small areas where bedrock is within a depth of 20 inches. Small steep areas within coves have a thicker surface layer than is typical.

This soil is fairly well suited to adapted species of trees. It is suited to such recreational uses as hunting and hiking. Capability unit VIIe–1; woodland suitability group 4f3.

Lindside Series

The Lindside series consists of moderately well drained, deep, loamy soils on river bottom lands. These soils formed in recent deposits from the rivers, in slightly depressional areas away from the channels. Slopes range from 0 to 2 percent.

In a representative profile the surface layer is brown, very friable silt loam 10 inches thick. The next layer is brown, friable silt loam 8 inches thick. Below this is mottled, brown, friable silt loam about 23 inches thick. This

layer is underlain by mottled, dark grayish-brown, stratified silt loam, silty clay loam, and loam.

Permeability is moderate, and available water capacity is high. Runoff is medium. Flooding is infrequent and very brief. Reaction is slightly acid or neutral. The soils are very easy to work and respond very favorably to good management.

These soils are used for corn, hay, and pasture.

Representative profile of Lindside silt loam:

Ap—0 to 10 inches, brown (10YR 4/3) silt loam; moderate, fine and medium, granular structure; very friable; many roots; neutral; clear, smooth boundary.

B1—10 to 18 inches, brown (10YR 4/3) silt loam; common, fine, dark yellowish-brown mottles in lower half; weak, medium and fine, subangular blocky structure; friable; many roots; neutral; clear, smooth boundary.

B2—18 to 41 inches; brown (10YR 4/3) silt loam; many, fine, dark-gray, grayish-brown, and dark yellowish-brown mottles; weak, medium and fine, subangular blocky structure; friable; few roots; neutral; clear, smooth boundary.

C—41 to 55 inches, dark grayish-brown (10YR 4/2), stratified silt loam, silty clay loam, and loam; many, medium, dark-gray (10YR 4/1) and dark yellowish-brown (10YR 4/4) mottles; structureless; friable; common fine, black concretions; neutral.

The Ap horizon is brown or dark grayish-brown silt loam or loam 6 to 10 inches thick. Depth to gray mottles averages about 18 inches but ranges from about 15 to 25 inches.

Ln—Lindside silt loam. This is a deep, nearly level, loamy, moderately well drained soil. It is on flood plains of the rivers, in narrow strips in slightly depressional areas away from the river channels.

Included with this soil in mapping are a few, small, poorly drained areas. Also included are a few small areas of loamy, well-drained colluvial soils on narrow parts of the river bottom lands.

This soil is well suited to corn, silage, hay, and pasture. It is less suited to crops such as alfalfa and tobacco, which are intolerant of excessive soil wetness during rainy spells. The hazard of flooding and seasonal wetness make this soil poorly suited to use as building sites. Capability unit IIw–1; woodland suitability group 2w8.

Litz Series

The Litz series consists of moderately deep, loamy, excessively drained soils on highly dissected, steep shale hills. Slopes range from about 8 to 60 percent.

In a representative profile the surface layer is brown shaly silt loam about 5 inches thick. Below this is yellowish-brown, friable shaly silty clay loam about 9 inches thick. Partly weathered, noncalcareous shale bedrock is at a depth of 25 inches.

Permeability is moderate, and available water capacity is low. Natural fertility is low. Reaction is strongly acid or very strongly acid, except where the surface layer has been limed. The soils give fair response to management.

Litz soils are used mainly for pasture and hay. A large part of the acreage, particularly the steeper areas, are still in forest or in abandoned fields that are reverting to forest.

Representative profile of Litz shaly silt loam, 8 to 20 percent slopes:

Ap—0 to 5 inches, brown (10YR 4/3) shaly silt loam; weak, fine, granular structure; very friable; 10 to 15 percent, by volume, acid shale fragments; many roots; clear, wavy boundary.

B2—5 to 14 inches, yellowish-brown (10YR 5/4) shaly silty clay loam; weak, fine, subangular blocky structure; friable; about 45 percent acid shale fragments; common roots; strongly acid; gradual, wavy boundary.

C1—14 to 25 inches, yellowish-brown (10YR 5/4) shaly silty clay loam; weak, fine, subangular blocky structure; friable; 60 percent shale fragments; few roots; strongly acid.

C2—25 inches, rippable, noncalcareous shale; about 10 percent fine earth coatings on steeply dipping strata of shale.

The Ap horizon is brown or yellowish-brown shaly silt loam or shaly silty clay loam 4 to 6 inches thick.

The B2 horizon is yellowish-brown shaly silt loam or shaly silty clay loam. In places there is a B2t horizon consisting of yellowish-red or red, firm silty clay.

Shale bedrock is at a depth of 20 to 36 inches in most areas, but in places it is exposed at the surface.

LzD—Litz shaly silt loam, 8 to 20 percent slopes. This is a sloping, moderately steep soil. It is on winding tops of shale hills. It has the profile described as representative of the series.

The surface layer is brown or yellowish-brown, friable shaly silt loam and is 4 inches to about 7 inches thick. It contains some soft and hard shale fragments. The subsoil is yellowish-brown shaly silt loam or shaly silty clay loam. It is interrupted at intervals by seams of yellowish-red, firm silty clay. Rippable shale rock is at a depth of about 25 inches.

Included with this soil in mapping are small areas of soils that have a moderately deep, reddish, clayey subsoil. Some severely eroded areas are somewhat shallower over the shale bedrock than is typical of this Litz soil. Also included are areas of soils that are similar to the Litz soil, but they are underlain by partly weathered calcareous shale.

This soil is fairly well suited to locally grown hay and pasture plants and to trees. Although permeability of this soil is moderate, the underlying shale is nearly impervious; this affects many uses of the soil for engineering. Capability unit VIe–3; woodland suitability group 3f8.

LzE—Litz shaly silt loam, 20 to 35 percent slopes. This is a steep soil. It is on fairly short hillsides where it formed in material weathered from shale. Fragments of soft to hard shale are on the surface and throughout the profile. Many of the fragments in the surface layer are soft enough to crush between the fingers. The tilted shale rock is at a depth of about 20 to 35 inches.

The surface layer is yellowish-brown shaly silt loam 4 to 7 inches thick. Below this is yellowish-brown to yellowish-red shaly silty clay loam or shaly silt loam that extends to rock.

Included with this soil in mapping are soils that have shale rock at the surface. Also included are a few places where the subsoil is yellowish-red silty clay.

This soil is fairly well suited to pasture and trees. Steepness of slope, low available water capacity, and shale fragments are the main limitations to farming and to most other uses. Permeability of the soil is moderate, but the underlying shale is nearly impervious. This makes the soil suitable for such uses as pond reservoirs, but it causes high runoff during heavy rains. The upper part of the shale rock is rippable. Deep plowing, or subsoiling, deepens the rooting zone and increases capacity for water storage. Capability unit VIe–3; woodland suitability group 3f8.

LzE3—Litz shaly silt loam, 20 to 35 percent slopes,

severely eroded. This is a steep soil on hillsides. Areas are 3 to 20 acres. The soil formed from acid shale. Many soft and hard shale fragments are on the surface and scattered throughout the profile. Acid shale is at a depth of about 20 to 30 inches in most places.

The surface layer is yellowish-brown shaly silt loam 4 or 5 inches thick. Below this is yellowish-brown to yellowish-red shaly silty clay loam or shaly silt loam. In many places there are vertical seams and scattered fragments of yellowish-red silty clay in and below the surface layer.

Included with this soil in mapping are rills and a few knee-deep gullies in some fields. In most fields there are spots or small patches where the shale rock is at the surface.

This soil is fairly well suited to pasture. Low available water capacity, steepness of slope, and depth to shale are the main limitations to farming as well as to most other uses. Water enters the shale rock very slowly. This makes the soil suitable for such uses as pond reservoirs, but it causes the soil to become quickly saturated and to have high runoff. The upper part of the shale rock is rippable. Deep plowing, or subsoiling, deepens the rooting zone and increases capacity for water storage. Capability unit VIIe–1; woodland suitability group 4c3e.

LzF—Litz shaly silt loam, 35 to 60 percent slopes. This is a very steep, excessively drained soil. It is on highly dissected shale hills and ridges.

The surface layer is yellowish-brown or brown shaly silt loam 3 to 5 inches thick. The subsoil is commonly yellowish-brown to yellowish-red shaly silty clay loam or shaly silt loam, and in places narrow bands of yellowish-red silty clay are present. Acid shale bedrock is at a depth of 20 to 30 inches, but narrow tongues of soil material extend down seams in the shale to a depth of several feet.

Included with this soil in mapping are small areas of soils that contain numerous small gullies. Also included are a few spots where slopes are somewhat less steep and many small areas where rock is at a depth of less than 20 inches.

This soil is fairly well suited to adapted trees, mainly pine. Very steep slopes are limitations to most other uses. Capability unit VIIe–1; woodland suitability group 3f8.

Melvin Series

The Melvin series consists of poorly drained soils on flood plains. These soils are in low, flat areas away from the stream channels. They formed in sediment deposited by rivers and creeks. Slopes range from 0 to 2 percent.

In a representative profile the surface layer is dark-gray silt loam about 7 inches thick. The subsoil is mottled, grayish-brown, friable silty clay loam to a depth of 18 inches. The next layer is dark-gray silty clay loam that has brownish mottles. Below this is mottled, gray, stratified clay loam and fine sand.

Permeability is moderate, and available water capacity is high. Reaction is slightly acid and neutral. Runoff is low. Most areas are subject to brief flooding and some ponding. The water table rises to within a few inches of the surface during rainy seasons. The soils are difficult to work but respond favorably to artificial drainage and other management practices.

Melvin soils are used for pasture and hay. A few artificially drained areas are used for silage late in summer.

Representative profile of Melvin silt loam:

Ap—0 to 7 inches, dark-gray (10YR 4/1) silt loam; common, fine, strong-brown (7.5YR 5/6) and dark grayish-brown (10YR 4/2) mottles; moderate, fine, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

B2g—7 to 18 inches, grayish-brown (2.5YR 5/2) silty clay loam; many, fine, dark-brown (7.5YR 4/4) and dark-gray (10YR 4/1) mottles; very weak, medium, subangular blocky structure; friable; common roots; neutral; clear, smooth boundary.

C1g—18 to 44 inches, dark-gray (N 4/) silty clay loam; common, fine, dark-gray (10YR 4/1) and dark yellowish-brown (10YR 4/4) mottles; massive; friable; few roots; slightly acid; clear, smooth boundary.

C2g—44 to 60 inches, gray (10YR 5/1) stratified clay loam; common coarse streaks of very dark gray (10YR 3/1); few thin strata of light-gray (10YR 7/1), clean fine sand; structureless; friable (waterlogged); neutral.

The Ap horizon is dark-gray, dark grayish-brown, or gray silt loam or silty clay loam. It is 5 to 8 inches thick.

The B2g horizon is gray, grayish brown, or dark grayish brown and has mottles in shades of gray, brown, and yellow.

In some places the Cg horizon contains a small amount of gravel.

Ma—Melvin silt loam. This is a poorly drained, nearly level soil on flood plains. It formed in alluvial deposits in watersheds that drain areas of soils derived from limestone, shale, and siltstone. This soil is in slight depressional areas away from the channel and near the base of steeper slopes, where it receives runoff and seepage. The water table is at or near the surface during the winter and early in spring.

The surface layer is grayish-brown silt loam 5 to 8 inches thick. The subsoil, to a depth of about 1½ feet, is gray or grayish-brown silty clay loam mottled in shades of brown and yellow. Below this is stratified, gray silt loam and silty clay loam.

Included with this soil in mapping are a few small areas of somewhat poorly drained soils on the flood plains.

This soil is fairly well suited to pasture. Where it has been drained, it is suited to summer grain and silage. Capability unit IIIw–1; woodland suitability group 2w9.

Minvale Series

The Minvale series consists of deep soils on benches, foot slopes, and fans below steeper soils that formed in material derived from cherty dolomitic limestone. The material that washed or rolled from the steeper uplands. Slopes range from 2 to 20 percent.

In a representative profile the surface layer is brown silt loam about 9 inches thick. The next 6 inches is yellowish-brown silt loam. Below this, to a depth of 40 inches, is yellowish-red, friable cherty silty clay loam. This is underlain by several feet of yellowish-red, firm cherty silty clay. Chert gravel makes up about 10 percent of the upper 36 inches of the profile and about 20 percent of the lower part.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid or very strongly acid, except where the surface layer has been limed. The soils are very easy to work and respond very favorably to management.

Minvale soils are used for tobacco, corn, small grain, hay, and pasture. A few areas are still wooded.

Representative profile of Minvale silt loam, 5 to 12 percent slopes:

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; very friable; many roots; 10 percent, by volume, angular chert fragments; medium acid; abrupt, smooth boundary.

B1—9 to 15 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, subangular blocky structure; friable; common roots; 10 percent, by volume, angular chert gravel; strongly acid; clear, smooth boundary.

B21t—15 to 30 inches, yellowish-red (5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable; few roots; patchy clay films; 10 percent chert gravel; strongly acid; gradual, smooth boundary.

B22t—30 to 48 inches, yellowish-red (5YR 5/8) silty clay loam; moderate, medium and fine, subangular blocky structure; friable; discontinuous clay films; 10 percent chert fragments; strongly acid; clear, smooth boundary.

B23t—48 to 62 inches, yellowish-red (5YR 5/8) cherty silty clay; few, medium, yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/6), and red (2.5YR 4/8) mottles; strong, medium and fine, angular blocky structure; firm, slightly plastic; continuous clay films; 15 to 20 percent chert fragments; strongly acid.

Chert content of the profile ranges from about 5 to 30 percent, but it is commonly 10 to 15 percent in the upper part of the profile and 15 to 20 percent in the lower part.

The Ap horizon is brown, dark grayish-brown, or yellowish-brown silt loam or loam. It is 6 to 10 inches thick.

The B1 horizon, where present, is yellowish-brown, strong-brown, or yellowish-red friable silty clay loam. In some places the B2t horizon is red silty clay loam. Clayey residuum is at a depth of 2½ feet to about 5 feet.

MeB—Minvale silt loam, 2 to 5 percent slopes. This is a deep, gently sloping, well-drained, loamy soil. It is on fans and foot slopes. It formed in material that washed or rolled from soils derived from cherty dolomitic limestone.

The surface layer is friable, brown silt loam about 10 inches thick. Beneath this is about 8 inches of strong-brown or yellowish-brown, friable silt loam. Below this is about 3 feet of yellowish-red, friable, silty clay loam over reddish cherty clay. The profile is 10 to 15 percent chert throughout.

Included with this soil in mapping are a few small areas of soils that are 15 to 30 percent chert.

This soil is very well suited to all locally grown crops. It is also well suited to use as homesites. Capability unit IIe–1; woodland suitability group 3o7.

MeC—Minvale silt loam, 5 to 12 percent slopes. This is a deep, sloping, loamy, reddish soil. It is on benches and foot slopes. It formed in material that moved downslope from soils that formed in residuum derived from cherty dolomite. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of soils that are 15 to 30 percent chert.

This soil is well suited to all commonly grown crops. It is suited to use as homesites. Slope is the main concern of management. Capability unit IIIe–1; woodland suitability group 3o7.

MeD—Minvale silt loam, 12 to 20 percent slopes. This is a deep, loamy, moderately steep, well-drained soil on benches and foot slopes. It formed in material that washed or rolled downslope from soils that are underlain by cherty dolomitic limestone.

The surface layer is brown silt loam 5 to 8 inches thick. The subsoil is reddish silty clay loam several feet thick. The profile is about 10 percent, by volume, angular chert gravel throughout.

Included with this soil in mapping are a few small areas of soils that have a cherty profile. In a very few severely eroded places the surface layer is yellowish-red silty clay loam.

This soil is fairly well suited to all commonly grown crops. Slope is the main concern of management. Capability unit IVe–1; woodland suitability group 3o7.

Montevallo Series

The Montevallo series consists of shallow, shaly, droughty soils underlain by greenish and multicolored fissile shale. These soils are on narrow, low ridges that are scattered in a linear pattern through the limestone valleys and at the base of high siltstone ridges. Slopes range from about 8 to 50 percent.

In a representative profile the surface layer is brown shaly silt loam about 5 inches thick. The subsoil is yellowish-brown, very friable shaly silt loam 9 inches thick. Below this is soft, greenish, multicolored, acid shale and a few interfingering tongues of soil material.

Permeability is moderate, and available water capacity is low. Natural fertility is very low. Reaction is strongly acid, except where the surface layer has been limed. The soils are difficult to work and respond poorly to management. Plants suffer from lack of moisture after only short dry periods.

The steeper, highly dissected areas of Montevallo soils are used for woodland or pasture; many areas are idle and are slowly reverting to scrubby woodland. Narrow bands of Montevallo soils in the smoother valleys are used in the same manner as the adjacent better soils.

Representative profile of Montevallo shaly silt loam, 8 to 25 percent slopes:

Ap—0 to 5 inches, brown (10YR 4/3) shaly silt loam; weak, fine, granular structure; very friable; common roots; about 20 percent fine multicolored shale fragments; neutral; abrupt, smooth boundary.

B2—5 to 14 inches, yellowish-brown (10YR 4/4) shaly silt loam; weak, fine, granular structure; very friable; about 40 percent, by volume, shale fragments up to 1 inch in diameter; strongly acid; clear, wavy boundary.

C1—14 to 25 inches, soft, greenish and multicolored, fissile, acid shale; about 10 percent, by volume, soil material tonguing into thin seams between shale layers; very strongly acid; gradual, irregular boundary.

C2—25 to 35 inches, moderately hard, acid, multicolored shale; can be dug with spade.

The Ap horizon is brown or grayish-brown shaly silt loam or loam. It is 4 to 6 inches thick. Where severely eroded, it is yellowish brown or olive brown.

The B horizon is shaly silt loam or shaly loam 6 to 14 inches thick.

The bedrock is black, brown, and red, and it grades toward phyllite or slate. In some places it is carboniferous.

MnD—Montevallo shaly silt loam, 8 to 25 percent slopes. This is a shallow, shaly, excessively drained soil underlain by acid shale. It is generally on narrow, low ridges adjacent to reddish upland soils of the broad limestone valleys. A few broader areas of this soil are on tops of dissected ridges and on tops of hills. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of moderately deep soils that have a reddish, clayey subsoil. Also included in places are very narrow bands of rocky, red, clayey soils along the northern and southern mar-

gins of this Montevallo soil, and a few severely eroded spots.

This soil is very poorly suited to most uses. It is poorly suited to pasture but is fairly well suited to adapted pines. Shallow depth and impermeable bedrock make it poorly suited to septic tank disposal systems. Capability unit VIe–3; woodland suitability group 4d3.

MnE—Montevallo shaly silt loam, 25 to 50 percent slopes. This is a shallow, steep and very steep, excessively drained, shaly soil. It is on the sides of dissected hills and on knobby outliers of the mountains.

The surface layer is brown shaly silt loam 3 to 5 inches thick. The subsoil is yellowish-brown shaly silt loam. Greenish and multicolored acid shale bedrock is at a depth of about 10 to 18 inches.

Included with this soil in mapping are a few small areas of soils that have shallow gullies. Also included are a few small areas of soils that have shale bedrock exposed at the surface.

This soil is only fairly well suited to adapted trees. Extremely steep slopes make many areas practically inaccessible except on foot. Capability unit VIIe–1; woodland suitability group 4d3.

MoE—Montevallo-Talbott complex, 20 to 45 percent slopes. This complex is in long, narrow belts on the northern sides of knobby high ridges. Its position coincides with that of the Rutledge, Rogersville, and Maryville Formations. It consists of alternate strips of Montevallo and Talbott soils.

This complex is 60 percent Montevallo soils and 40 percent Talbott soils.

The Montevallo soils have a surface layer of brown shaly silt loam about 2 to 5 inches thick. The subsoil is yellowish-brown shaly silt loam 8 to 15 inches thick. Depth to soft greenish shale is less than 20 inches.

The Talbott soils are predominantly very rocky. They are in small odd-shaped patches and strips between outcrops and ledges. They have a surface layer of brown friable silt loam 4 to 5 inches thick. The subsoil is reddish clay about 3 feet thick.

These soils are poorly suited to most uses. Pine and cedar trees grow slowly on these soils. Capability unit VIIs–1; woodland suitability group 4d3.

Needmore Series

The Needmore series consists of moderately deep, moderately well drained or well drained, gently sloping and sloping soils on tops of low shale hills. The soils formed in material weathered from calcareous shale. Slopes range from 2 to 12 percent.

In a representative profile the surface layer is yellowish-brown, friable silt loam about 7 inches thick. The subsoil is yellowish-brown, friable silty clay loam in the upper part and yellowish-brown, firm silty clay in the lower part. The next layer is mottled brown and yellow silty clay and shale fragments. Shale bedrock is at a depth of 40 inches.

Permeability is moderately slow, and available water capacity is medium. Natural fertility is low. Reaction is medium acid to very strongly acid, except where the surface layer has been limed. The soils are easy to work and respond favorably to management.

Needmore soils are used for corn, tobacco, small grain, hay, and pasture. A few small areas remain in woods.

Representative profile of Needmore silt loam, 2 to 5 percent slopes:

Ap—0 to 7 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, granular structure; friable; many roots; slightly acid; clear, smooth boundary.

B1—7 to 10 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; friable; common roots; medium acid; clear, smooth boundary.

B2t—10 to 24 inches, yellowish-brown (10YR 5/6) silty clay; moderate and strong, medium, subangular blocky structure; very firm; continuous clay films on ped faces; medium acid; clear, smooth boundary.

B3—24 to 34 inches, yellowish-brown (10YR 5/6) silty clay; common, medium, brownish-yellow (10YR 6/6), strong-brown (7.5YR 5/6), and very pale brown (10YR 7/3) mottles; moderate, medium and coarse, angular blocky structure; very firm; few fragments of dark weathered shale; discontinuous clay films on faces of peds; strongly acid; clear, smooth boundary.

C—34 to 40 inches, mottled yellowish-brown (10YR 5/6), brownish-yellow (10YR 6/6), strong-brown (7.5YR 5/6), and very pale brown (10YR 7/3) seams and pockets of silty clay soil material between partly weathered shale fragments; massive; very firm; medium acid; gradual, wavy boundary.

R—40 inches, dark calcareous shale.

The Ap horizon is yellowish-brown, brown, or light yellowish-brown silt loam or silty clay loam. It is 5 to 10 inches thick.

The Bt horizon is yellowish-brown or brownish-yellow to reddish-yellow silty clay.

Calcareous shale bedrock is at a depth of 20 to 40 inches.

NdB—Needmore silt loam, 2 to 5 percent slopes. This is a moderately deep, gently sloping, moderately well drained to well drained soil on ridgetops. It formed in material weathered from calcareous shale. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of nonacid, shaly soils that have calcareous shale bedrock within about 15 or 20 inches of the surface. A few small areas of a soil that has a fragipan are also included.

This soil is well suited to all locally grown crops. Some areas of this soil are being used for urban expansion. Slow permeability and lack of sufficient depth above the impermeable shale bedrock are severe limitations to such uses as septic tank disposal systems. Also, the slow permeability makes this soil suitable for such uses as sites for water impoundment. Capability unit IIIe–4; woodland suitability group 3c2.

NdC—Needmore silt loam, 5 to 12 percent slopes. This is a moderately deep, sloping, moderately well drained or well drained soil on tops of low shale hills. It formed in material weathered from calcareous shale.

The surface layer is yellowish-brown silt loam 5 to 8 inches thick. The subsoil is yellowish-brown, firm silty clay. Soft calcareous shale bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of shallow shaly soils. Also included are small, severely eroded areas of soils that have a surface layer of yellowish-brown silty clay loam.

This soil is fairly well suited to all locally grown crops. Lack of moisture late in summer is a limitation to most cultivated crops. This soil is poorly suited to septic tank sewage disposal systems because permeability is slow and shale rock is at a depth of 40 inches. However, these same features make it suitable for such uses as sites for water impoundment. Capability unit IVe–3; woodland suitability group 3c2.

Figure 15.—**Profile of a Nella cobbly loam.**

Nella Series

The Nella series consists of deep, loamy soils on foot slopes. The soils formed in old colluvial deposits derived from soils underlain by sandstone and siltstone. Slopes range from about 5 to 45 percent.

In a representative profile (fig. 15), the surface layer is brown cobbly loam about 9 inches thick. The subsoil is yellowish-red, friable cobbly clay loam to a depth of 50 inches and red, firm clay between depths of 50 and 70 inches. It is about 20 percent, by volume, sandstone fragments.

Permeability is moderate, and available water capacity is medium. Reaction is strongly acid and very strongly acid, except where the surface layer has been limed. The soils respond well to management.

About two-thirds of the acreage of Nella soils is still in hardwood forest. The cleared part is used for pasture, hay, and some tobacco, corn, and small grain.

Representative profile of Nella cobbly loam, 12 to 20 percent slopes:

Ap—0 to 9 inches, brown (7.5YR 4/4) cobbly loam; weak, medium, granular structure; very friable; many roots; about 20 percent, by volume, sandstone cobbles and gravel; strongly acid; abrupt, smooth boundary.

B1—9 to 16 inches, yellowish-red (5YR 5/6) cobbly clay loam; weak, medium, subangular blocky structure; friable; common roots; 20 percent sandstone cobbles; strongly acid; gradual, smooth boundary.

B21t—16 to 39 inches, yellowish-red (5YR 4/6) cobbly clay loam; moderate, medium, subangular blocky structure; friable; few roots; 25 percent cobbles; patchy clay films; very strongly acid; gradual, smooth boundary.

B22t—39 to 50 inches, yellowish-red (5YR 4/6) cobbly clay loam; moderate, medium, subangular blocky structure; friable; 25 percent cobbles; continuous clay films; very strongly acid; gradual, smooth boundary.

B23t—50 to 70 inches, red (2.5YR 4/6) cobbly clay; strong, medium, subangular blocky structure; firm; continuous clay films; 25 percent cobbles; very strongly acid.

The Ap horizon is brown, yellowish-brown, or strong-brown cobbly or gravelly loam 5 to 10 inches thick. A few inches of strong-brown or yellowish-brown loam underlies the A horizon in some places. Below this is 5 to 10 feet of yellowish-red or red cobbly clay loam or cobbly sandy clay loam. In some places this layer grades to cobbly clay at a depth of more than 4 feet. It is about 15 to 35 percent rock fragments.

Sandstone or shale bedrock is at a depth greater than 6 feet.

NeC—Nella cobbly loam, 5 to 12 percent slopes. This is a sloping soil on benches or foot slopes of the higher mountains. There are only a few areas of this soil in the survey area.

The surface layer is brown cobbly loam about 9 inches thick. The subsoil is yellowish-red cobbly clay loam several feet thick. The cobbles are mostly sandstone and are 3 to 7 inches across.

Included with this soil in mapping are a few small areas of soils that are similar to Nella soils, but they are slightly steeper. Also included are soils similar to Nella soils, but they are 15 to 30 percent sandstone gravel instead of cobbles.

This soil is well suited to all locally grown crops, but stones interfere to some extent with tillage and mowing. Capability unit IVe–2; woodland suitability group 3x8.

NeD—Nella cobbly loam, 12 to 20 percent slopes. This is a deep, loamy, well-drained soil. It is on broad foot slopes of the sandstone and siltstone mountains. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few areas of soils similar to Nella soils, but they have a yellowish-brown or strong-brown subsoil. Also included are a few areas that have less stones and some areas that have 15 to 30 percent gravel.

Stones are a limitation to cultivation and mowing. In some areas the stones have been removed from the surface layer; these areas are well suited to hay and pasture plants if proper liming, fertilization, and other management practices are used. Capability unit VIe–1; woodland suitability group 3x8.

NeE—Nella cobbly loam, 20 to 45 percent slopes. This is a deep, loamy, steep, well-drained soil. It is on mountain foot slopes.

The surface layer is brown cobbly loam 5 to 10 inches thick. The subsoil is yellowish-red cobbly clay loam 5 feet or more in thickness. The cobbles are mostly sandstone and range from 3 to 7 inches across.

Included with this soil in mapping are a few areas of soils similar to Nella soils, but they have a strong-brown or yellowish-brown subsoil. Also included are a few areas

of soils that have sandstone or shale bedrock at a depth of about 3 feet. Some areas of Nella soils that are 15 to 30 percent gravel are also included.

Stones and steepness of slope are limitations to such uses as timber production and pasture. Capability unit VIe–1; woodland suitability group 3x8.

Rock Outcrop-Talbott Complex, 10 to 40 Percent Slopes

RtE—Rock outcrop-Talbott complex, 10 to 40 percent slopes. This complex is mostly on the steep walls of long narrow valleys. In many places the areas are deeply pitted by limestone sinks.

This complex is 40 to 80 percent outcrops of limestone bedrock and 10 to 25 percent Talbott soils.

The outcrops of limestone bedrock extend from only a few inches to as much as 3 or 4 feet above the surface. Between the rocks are strips and patches of Talbott soils.

Talbott soils are fine textured and in most places are 20 to 40 inches deep over rock. In some places, however, tongues of reddish clay extend to a depth of 5 to 10 feet or more.

The areas of this complex are rough and are unsuited to most uses. Abandoned areas have volunteer stands of redcedar, which make fair growth. Capability unit VIIs–1; woodland suitability group 5x3.

Sensabaugh Series

The Sensabaugh series consists of loamy, well-drained soils in intermittent drainageways and on alluvial fans. The soils are mostly near the foot of steep siltstone ridges, where they formed in gravelly material that washed from upland soils underlain by siltstone, shale, and sandstone. Slopes range from about 2 to 5 percent.

In a representative profile the surface layer is friable, brown gravelly loam about 9 inches thick. Beneath this is brown, friable gravelly loam and dark-brown and dark yellowish-brown gravelly clay loam to a depth of 62 inches. The profile is about 20 to 30 percent, by volume, coarse fragments of siltstone and sandstone throughout.

Permeability is moderate, and available water capacity is high. Reaction is medium acid or slightly acid. The soils are easy to work and respond very well to management.

Sensabaugh soils are used for tobacco, corn, small grain, hay, and pasture.

Representative profile of Sensabaugh gravelly loam:

Ap—0 to 9 inches, brown (7.5YR 4/2) gravelly loam; weak, medium, granular structure; very friable; many roots; about 20 percent, by volume, fragments of shale and reddish and brownish sandstone ranging from less than 1 inch to 4 inches across; slightly acid; clear, smooth boundary.

B21—9 to 20 inches, brown (7.5YR 4/4) gravelly loam; weak, medium, subangular blocky structure; friable; many roots; about 25 percent greenish and brownish fragments of shale and sandstone as much as about 4 inches across; medium acid; gradual, wavy boundary.

B22—20 to 36 inches, brown (7.5YR 4/4) gravelly clay loam; weak, medium, subangular blocky structure; friable; common fine roots; about 30 percent, by volume, shale and sandstone fragments as much as 4 inches across; medium acid; gradual, wavy boundary.

A1b—36 to 42 inches, dark-brown (10YR 4/3) gravelly loam; weak, medium, subangular blocky structure; friable; few fine roots; about 20 percent coarse fragments; medium acid; gradual, wavy boundary.

C—42 to 62 inches, dark yellowish-brown (10YR 4/4) gravelly loam; weak, medium, subangular blocky structure; massive in some parts; friable; few fine roots; 30 percent coarse fragments; medium acid.

The Ap horizon is brown, dark yellowish-brown, or reddish-brown gravelly or channery loam or fine sandy loam.

The B horizon is brown, reddish-brown, strong-brown, or dark yellowish-brown gravelly or channery loam or clay loam. Gray mottles are in some profiles below a depth of 30 inches.

Siltstone and sandstone gravel and thin, flat fragments as much as 6 inches across make up about 10 to 25 percent of the Ap horizon, 15 to 35 percent of the B horizon, and 15 to 45 percent of the C horizon.

Sa—Sensabaugh gravelly loam. This is a brown, well-drained, loamy soil on alluvial fans and in narrow drainageways. It formed in material washed from soils on steep slopes and underlain by siltstone, sandstone, and shale. Slopes are 2 to 5 percent.

Included with this soil in mapping are small areas of a nongravelly soil. Also included are a few small areas of moderately well drained soils.

This soil is well suited to all locally grown crops. It is particularly well suited to tobacco. Some areas are briefly flooded at infrequent intervals. Coarse fragments and flooding are the main concerns of management. Capability unit IIs–1; woodland suitability group 2o7.

Sequatchie Series

The Sequatchie series consists of deep, loamy, well-drained soils on intermediate terraces of creeks. The soils formed in old alluvial deposits washed from soils derived from siltstone, sandstone, and acid shale. Slopes range from 0 to 2 percent.

In a representative profile the surface layer is dark-brown loam about 9 inches thick. The subsoil is dark yellowish-brown, yellowish-brown, and strong-brown, friable loam to a depth of 53 inches. Below this is yellowish-brown stratified fine sandy loam and loam.

Permeability is moderate, and available water capacity is high. Reaction is strongly acid, except where the surface has been limed. The soils are very easy to work and respond very favorably to management.

Sequatchie soils are used for tobacco, corn, small grain, hay, and pasture.

Representative profile of Sequatchie loam:

Ap—0 to 9 inches, dark-brown (10YR 3/3) loam; weak, medium and fine, granular structure; very friable; many roots; strongly acid; abrupt, smooth boundary.

B1—9 to 18 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine and medium, subangular blocky structure; friable; common roots; strongly acid; clear, smooth boundary.

B2t—18 to 40 inches, strong-brown (7.5YR 5/6) loam; weak, medium, subangular blocky structure; friable; discontinuous clay films; few roots; strongly acid; clear, smooth boundary.

B3—40 to 53 inches, yellowish-brown (10YR 5/6) loam; few, medium, pale-brown (10YR 6/3) mottles; weak, medium and coarse, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

C—53 to 60 inches, yellowish-brown (10YR 5/4) stratified loam and fine sandy loam; massive; friable; strongly acid.

The Ap horizon is dark-brown or dark yellowish-brown loam or fine sandy loam.

The B horizon is yellowish-brown, dark yellowish-brown, or strong-brown loam or silt loam.

The C horizon is 15 to 30 percent gravel in some profiles. Bedrock is at a depth of more than 6 feet.

Se—Sequatchie loam. This is a deep, loamy, well-drained soil on nearly level stream terraces of intermediate age.

Included with this soil in mapping are a few, small, moderately well drained areas. In a few small pockets of shallow depressions is a moderately well drained soil that has a fragipan. Also included are soils of small creek terraces that are similar to the Sequatchie soils, but they have a brown surface layer. Some spots have as much as 30 percent gravel throughout the profile.

This soil is well suited to all locally grown crops. Capability unit I–1; woodland suitability group 2o7.

Sequoia Series

The Sequoia series consists of moderately deep, well-drained soils on low ridgetops and hillsides in the shale valleys. The soils formed in residual material weathered from shale. Slopes range from 3 to 20 percent.

In a representative profile the surface layer is yellowish-brown silt loam 7 inches thick. The subsoil is yellowish-red, firm silty clay. Soft acid shale bedrock is at a depth of 38 inches.

Permeability is moderately slow, and available water capacity is medium. Runoff is medium to rapid. Reaction is strongly acid or very strongly acid, except where the surface layer has been limed. The soils are fairly easy to work and give fair response to management.

Sequoia soils are used for pasture, hay, tobacco, corn, and small grain. A few small tracts are in woods.

Representative profile of Sequoia silt loam, 3 to 12 percent slopes, eroded:

Ap—0 to 7 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium and fine, granular structure; friable; many roots; medium acid; clear, smooth boundary.

B21t—7 to 24 inches, yellowish-red (5YR 5/6) silty clay; moderate, medium, subangular blocky structure; firm, plastic; continuous clay films; few roots along ped interfaces; strongly acid; clear, smooth boundary.

B22t—24 to 34 inches, yellowish-red (5YR 5/6) silty clay; strong, medium, subangular and angular blocky structure; very firm, plastic; continuous clay films; strongly acid; gradual, wavy boundary.

B3—34 to 38 inches, yellowish-red (5YR 5/6) silty clay; common, medium, strong-brown and yellowish-brown mottles; moderate, medium, subangular blocky structure; firm, plastic; patchy clay films; about 35 percent, by volume, soft weathered shale in tilted layers; strongly acid.

C—38 inches, acid rippable shale; thin seams of soil material coating fragments and extending into cracks.

The Ap horizon is brown, yellowish-brown, or dark grayish-brown silt loam 5 to 9 inches thick. In severely eroded areas it is yellowish-red or strong-brown silty clay or silty clay loam.

The B2t horizon is strong brown, yellowish red, or red.

Shale bedrock is at a depth of about 20 to 40 inches.

SkC2—Sequoia silt loam, 3 to 12 percent slopes, eroded. This is a moderately deep, sloping soil. It is on low ridgetops and is underlain by noncalcareous shale. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of severely eroded soils that have a surface layer of yellowish-red or strong-brown silty clay 5 to 8 inches thick. A few small areas of shallow shaly soils are also included.

This soil is fairly well suited to all locally grown crops. It is poorly suited to septic tank sewage disposal systems. Slope, limited effective rooting depth, slow permeability, and limited available water capacity are all concerns of management. Capability unit IVe–3; woodland suitability group 3c2.

SkD2—Sequoia silt loam, 12 to 20 percent slopes, eroded. This is a moderately deep, moderately steep, well-drained soil on hillsides. It formed in material weathered from noncalcareous shale.

The surface layer is yellowish-brown or brown silt loam 5 to 7 inches thick. The subsoil is yellowish-red silty clay and is underlain by soft weathered shale at a depth of 20 to 40 inches.

Included with this soil in mapping are a few small areas of severely eroded soils and of shallow shaly soils.

This soil is fairly well suited to pasture and hay. Strong slopes, rapid runoff, limited rooting depth, and limited available water capacity are all concerns of management. Capability unit VIe–2; woodland suitability group 3c2.

Sewanee Series

The Sewanee series consists of nearly level, moderately well drained, loamy soils on flood plains of creeks and branches. The soils formed in alluvial sediment washed from soils derived from acid siltstone, sandstone, and shale.

In a representative profile the surface layer is brown, friable loam 9 inches thick. The subsoil is dark yellowish-brown, friable loam. Mottled brown, grayish, and yellowish and stratified loam and sandy loam is below a depth of about 22 inches. Shale or siltstone bedrock is at a depth of 4 to 6 feet.

Permeability is moderate, and available water capacity is high. Runoff is very slow. The soils are subject to occasional, very brief flooding. Reaction is strongly acid, except where the surface layer has been limed. The soils are very easy to work and respond very favorably to management.

Representative profile of Sewanee loam:

Ap—0 to 9 inches, brown (10YR 4/3) loam; weak, fine, granular structure; very friable; many roots; medium acid; clear, smooth boundary.

B2—9 to 22 inches, dark yellowish-brown (10YR 4/4) loam; few, medium, pale-brown (10YR 6/3) mottles; weak, coarse, subangular blocky structure; very friable; common roots; strongly acid; clear, smooth boundary.

C1—22 to 28 inches, brown (10YR 4/3) sandy loam; many medium, faint, grayish-brown (10YR 5/2) mottles; single grained; loose; few roots; few fine sandstone pebbles; strongly acid; abrupt, smooth boundary.

C2—28 to 48 inches, mottled gray (10YR 5/1), dark grayish-brown (10YR 4/2), and olive-yellow (2.5Y 6/6) loam; weak, medium, subangular blocky structure; firm; few fine sandstone pebbles; strongly acid.

C3—48 to 56 inches, mottled gray gravelly sandy loam.

The Ap horizon is brown or dark grayish-brown loam, silt loam, or fine sandy loam 6 to 10 inches thick.

The B horizon is yellowish-brown, brown, or dark yellowish-brown loam or silt loam. Gray or grayish-brown mottling is at a depth of 12 to 24 inches, but it is at an average depth of about 18 inches.

The lower part of the C horizon contains thin strata of loamy sand and gravel in some places.

Shale or siltstone bedrock is at a depth of 4 to 6 feet.

Sn—Sewanee loam. This is a moderately well drained, nearly level, loamy soil. It is on flood plains of creeks and their branches. It formed in recent alluvial deposits washed from soils underlain by acid shale, siltstone, and sandstone.

Included with this soil in mapping are strips of well-drained loamy soils along the streambanks. Also included are a few poorly drained spots well away from the stream channels.

This soil is well suited to corn, silage, hay, and pasture. Some damage to crops is to be expected because there is occasional, very brief flooding. Tobacco and alfalfa are not generally grown on this soil. Artificial drainage can reduce surface ponding in some areas. Capability unit IIw–1; woodland suitability group 2w8.

Shouns Series

The Shouns series consists of deep, loamy, well-drained soils on benches, toe slopes, and fans. The soils formed in old colluvial deposits that washed or rolled from high siltstone and shale ridges. They are underlain at a depth of several feet by shale or siltstone. Slopes range from 3 to 25 percent, and they face mostly to the south.

In a representative profile the surface layer is brown silt loam 8 inches thick. The subsoil is strong-brown, friable silt loam in the upper 10 inches and yellowish-red, friable silt loam in the next 10 inches. Below this is yellowish-red, firm silty clay loam to a depth of 55 inches. The lower 21 inches of the subsoil is reddish-brown, firm clay loan. Siltstone bedrock is at a depth of 76 inches.

Permeability is moderate, and available water capacity is high. Reaction is medium acid or strongly acid, except where the surface layer has been limed. The soils are very easy to work and respond very favorably to management.

Shouns soils are used for tobacco, corn, hay, small grain, and pasture. The town of Rogersville is located mainly on these soils.

Representative profile of Shouns silt loam, 3 to 12 percent slopes:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; very friable; many roots; medium acid; clear, smooth boundary.

B1—8 to 18 inches, strong-brown (7.5YR 5/6) silt loam; moderate, fine, subangular blocky structure; friable; patchy clay films; few, partly rounded, gray and reddish siltstone fragments; strongly acid; clear, smooth boundary.

B21t—18 to 28 inches, yellowish-red (5YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable; patchy clay films; 10 to 12 percent siltstone gravel; strongly acid; clear, smooth boundary.

B22t—28 to 55 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; firm; continuous clay films; few siltstone fragments; strongly acid; clear, smooth boundary.

B3—55 to 76 inches, reddish-brown (5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films on vertical faces and on pebbles; strongly acid; clear, smooth boundary.

R—76 inches, variegated yellowish-red and greenish soft and hard siltstone.

A few siltstone, sandstone, or shale fragments are scattered throughout the profile.

The Ap horizon is silt loam, loam, or silty clay loam 5 to 10 inches thick.

In a few places the B1 horizon is thin or is absent. The B2t horizon is yellowish-red or strong-brown silty clay loam, clay loam, or silt loam.

Bedrock is at a depth of more than 5 feet.

SoC—Shouns silt loam, 3 to 12 percent slopes. This is a deep, sloping, well-drained, loamy soil on benches, fans, and toe slopes below high siltstone and shale ridges. It formed in old colluvial deposits of material that rolled or washed from these ridges. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of moderately deep, clayey soils over shale. Also included are small, severely eroded areas of Shouns soils that have a surface layer of silty clay loam.

This soil is well suited to all locally grown crops. It is well suited to use as residential sites and to other nonfarm uses. Capability unit IIIe–1; woodland suitability group 3o7.

SoD—Shouns silt loam, 12 to 25 percent slopes. This is a deep, moderately steep, well-drained, productive soil. It is on foot slopes and benches below high siltstone and shale ridges.

The surface layer is brown silt loam 5 to 8 inches thick. The subsoil is yellowish-red silty clay loam more than 5 feet deep.

Included with this soil in mapping are a few small areas of moderately deep, reddish, clayey soils. A few small areas of soils are severely eroded. Some spots contain about 15 percent siltstone gravel.

This soil is well suited to hay and pasture. Slope is the main concern of management. Capability unit IVe–1; woodland suitability group 3o7.

Staser Series

The Staser series consists of deep, loamy, well-drained, nearly level, dark soils on bottom lands along rivers. The soils formed in recent alluvial deposits.

In a representative profile the upper 38 inches is dark-brown, friable silt loam or loam. Below this is stratified brown loam, silt loam, and fine sandy loam.

Permeability is moderate, and available water capacity is high. Reaction is slightly acid or neutral. The soils are very easy to work and respond extremely well to management. They are highly productive and are subject to infrequent, very brief flooding.

Staser soils are used for corn, small grain, hay, silage, and pasture.

Representative profile of Staser silt loam:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; moderate, fine, granular structure; very friable; many roots; slightly acid; clear, smooth boundary.

A11—8 to 26 inches, dark-brown (7.5YR 3/2) silt loam or loam; moderate, medium and fine, granular structure; friable; common roots; few, small, rounded sandstone and quartzite cobbles; slightly acid; clear, smooth boundary.

A12—26 to 38 inches, dark-brown (7.5YR 3/2) loam; weak, coarse, granular structure; very friable; few roots; slightly acid; clear, smooth boundary.

C—38 to 55 inches, brown (7.5YR 4/4) weakly stratified loam, silt loam, and fine sandy loam; structureless; very friable; slightly acid.

The A horizon is dark-brown or very dark brown silt loam, loam, and, rarely, fine sandy loam. It is 2 to 3½ feet thick.

In some profiles is a dark yellowish-brown or strong-brown B horizon that is similar in texture to the A horizon.

The C horizon has strata that range from sandy loam to silty clay loam.

Ss—Staser silt loam. This is a deep, loamy, nearly level, dark soil. It is on well-drained bottom lands adjacent to the channels of the rivers (fig. 16).

Included with this soil in mapping are some small areas of soils that have a dark-brown surface layer about 10

Figure 16.—Area of Staser silt loam on the narrow flood plains of the Clinch River.

inches thick and a subsoil of deep, friable, strong-brown or yellowish-brown silt loam, loam, or silty clay loam. Also included are a few small strips of moderately well drained soils.

This soil is highly productive and is well suited to all crops commonly grown in the area. Infrequent, very brief flooding makes it poorly suited to use as homesites and to other highly intensive uses. Capability unit I–1; woodland suitability group 2o7.

Statler Series

The Statler series consists of deep, loamy, well-drained soils on low terraces along the rivers. The soils formed in deep alluvial deposits. Slopes range from 0 to 3 percent.

In a representative profile the surface layer is dark-brown silt loam about 8 inches thick. The subsoil is strong-brown clay loam about 43 inches thick. Below this is yellowish-brown, friable loam.

Permeability is moderate, and available water capacity is high. Reaction is medium acid and strongly acid, except where the surface layer has been limed. The soils are easy to work and respond excellently to management.

Statler soils are used for tobacco, corn, small grain, silage, hay, and pasture.

Representative profile of Statler silt loam:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; moderate, fine, granular structure; very friable; many roots; slightly acid; clear, smooth boundary.

B21t—8 to 20 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium, subangular blocky structure; friable; common roots; patchy clay films; few quartzite pebbles; medium acid; clear, smooth boundary.

B22t—20 to 37 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable; few roots; discontinuous clay films; strongly acid; gradual, smooth boundary.

B23t—37 to 51 inches, strong-brown (7.5YR 5/6) clay loam; common, medium, pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; friable; patchy clay films; strongly acid; gradual, smooth boundary.

B3—51 to 58 inches, yellowish-brown (10YR 5/4) loam; common, medium, pale-brown (10YR 6/3) mottles; weak, coarse, subangular blocky structure; friable; strongly acid.

The Ap horizon is dark-brown or very dark grayish-brown silt loam or loam 6 to 10 inches thick.

The B horizon is strong-brown or yellowish-brown clay loam, silty clay loam, or, in a few places, silt loam or loam.

St—Statler silt loam. This is a deep, loamy, productive, well-drained soil. It is on low terraces along rivers, mostly above present-day flood levels. Slopes are 0 to 3 percent.

Included with this soil in mapping are a few, small, narrow strips of soils that have slopes of 3 to 5 percent. Also included are a few small areas of moderately well drained soils. Several areas have a surface layer of loam. Quartzite pebbles are few to common in some profiles.

This soil is well suited to all crops suited to the local climate. Capability unit I–1; woodland suitability group 2o7.

Sullivan Series

The Sullivan series consists of deep, loamy, nearly level, well-drained soils of the bottom lands. The soils formed in recent deposits near the channels of creeks that drain areas of soils underlain by siltstone, shale, and limestone.

In a representative profile the surface layer is brown loam about 7 inches thick. Beneath this, to a depth of 46 inches, are layers of brown, friable loam, silt loam, and fine sandy loam. Below this, and extending to a depth of 58 inches or more, is brown gravelly fine sandy loam.

Permeability is moderate, and available water capacity is high. Reaction is medium acid and slightly acid. The soils are easy to work and respond very favorably to good management. Most areas are subject to occasional, very brief flooding.

Sullivan soils are used for corn, small grain, hay, and pasture.

Representative profile of Sullivan loam:

Ap—0 to 7 inches, brown (10YR 4/3) loam; moderate, medium, granular structure; friable; many fine and medium roots; slightly acid; clear, smooth boundary.

B21—7 to 19 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine, subangular blocky structure; friable; common fine roots; few sandstone pebbles; slightly acid; gradual, wavy boundary.

B22—19 to 32 inches, brown (10YR 4/3) silt loam; weak, fine and medium, subangular blocky structure; friable; few fine roots; few sandstone pebbles; slightly acid; clear, smooth boundary.

C1—32 to 46 inches, brown (10YR 4/3) fine sandy loam; few thin strata of pale-brown silt loam; massive; very friable; few sandstone pebbles; slightly acid; gradual, smooth boundary.

C2—46 to 58 inches, brown (10YR 5/3) gravelly fine sandy loam; common, medium, faint, dark grayish-brown

(10YR 4/2) mottles; massive; about 20 percent, by volume, sandstone gravel; slightly acid.

The Ap horizon is brown or dark grayish-brown loam or silt loam 6 to 10 inches thick.

Shale or limestone bedrock is at a depth of 4 to 6 feet or more.

Su—Sullivan loam. This is a deep, loamy, well-drained soil on bottom lands. It is in long, narrow strips adjacent to the creek channels (fig. 17). Slopes are from 0 to 2 percent.

Included with this soil in mapping are adjoining narrow strips of moderately well drained soils that have a surface layer of brown silt loam or loam and a subsoil of mottled yellow, brown, and gray. Also included are small areas of well-drained soils that have a surface layer of silt loam and fine sandy loam.

This soil is suited to corn, small grain, silage, hay, and pasture. Occasional, very brief flooding sometimes results in crop damage and some scouring of the plow layer. Capability unit I–1; woodland suitability group 2o7.

Figure 17.—**Area of Sullivan loam on flood plain of creek.**

Taft Series

The Taft series consists of somewhat poorly drained soils that have a fragipan. The soils are in flat or slightly depressional areas of the river terraces, where they formed in old alluvial deposits. Slopes are 0 to 2 percent.

In a representative profile the surface layer is grayish-brown, friable silt loam 9 inches thick. The upper part of the subsoil is brownish and yellowish, friable silt loam that has grayish mottles. The fragipan, below a depth of 25 inches, is firm, brittle, light-gray silt loam that has yellowish and brownish mottles. Yellowish-brown silty clay that formed in material derived from shale bedrock is below a depth of 52 inches.

Permeability is slow, and available water capacity is medium. Runoff is slow. Reaction is strongly acid and very strongly acid, except where the surface layer has been limed. The soils are easy to work in summer and early in fall when the perched water table is several feet below the surface. Late in winter and early in spring the water table is within about 1 foot of the surface, and some ponding occurs. The Taft soils respond fairly well to surface drainage and other management practices.

Taft soils are used for pasture, hay, and, where artificially drained, corn and silage. A few areas are in hardwood forest.

Representative profile of Taft silt loam:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; very friable; many roots; medium acid; clear, smooth boundary.

B1—9 to 13 inches, light yellowish-brown (10YR 6/4) silt loam; weak, medium, subangular blocky structure; friable; few, fine, grayish-brown mottles; few roots; strongly acid; clear, smooth boundary.

B21—13 to 17 inches, brownish-yellow (10YR 6/6) silt loam; common, medium, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable; few roots; strongly acid; clear, smooth boundary.

B22—17 to 25 inches, light yellowish-brown (10YR 6/4) silt loam; many, fine to coarse, light brownish-gray (10YR 6/2) and gray (10YR 7/2) mottles; weak, medium, subangular blocky structure; friable; few roots; very strongly acid; gradual, wavy boundary.

Bx1—25 to 36 inches, light-gray (10YR 7/2) silt loam; many, fine and medium, light yellowish-brown (10YR 6/4) and pale-brown (10YR 6/3) mottles; weak, coarse, platy structure parting to weak, medium, subangular blocky; firm, brittle; few veins and pockets of grayish clay; very strongly acid; gradual, wavy boundary.

Bx2—36 to 52 inches, light-gray (10YR 7/2) silt loam; common, fine and medium, very pale brown (10YR 7/4) mottles; weak, coarse, platy structure parting to weak, medium, subangular blocky; firm, brittle; few veins and pockets of grayish clay; very strongly acid; gradual, wavy boundary.

IIBt—52 to 60 inches, yellowish-brown (10YR 5/6) silty clay; common, medium, very pale brown (10YR 7/4) and light-gray (10YR 7/2) mottles; weak, medium, subangular blocky structure; firm, plastic; discontinuous clay films; very strongly acid.

The Ap horizon is brown, grayish-brown, or pale-brown silt loam or loam. It is 5 to 10 inches thick.

The B horizon is yellowish brown or brownish yellow and has grayish mottles below a depth of 15 to 20 inches. The fragipan is gray and has brownish and yellowish mottles, or it is a mixture of all three colors. It is commonly silt loam or loam containing pockets of clay or silty clay. In some places the fragipan overlies a layer having a large amount of cobblestones.

Ta—Taft silt loam. This is a somewhat poorly drained, nearly level soil on old river terraces. It has a fragipan in the lower part of the subsoil.

Included with this soil in mapping are a few pockets of poorly drained soils and a few patches of moderately well drained soils.

This soil is fairly well suited to pasture and hay. Where surface drainage is adequate, it is fairly well suited to corn and silage. It is very poorly suited to residential use unless major and costly drainage work is done. Some

areas are in the fringe of urban expansion. Capability unit IIIw–2; woodland suitability group 3w8.

Talbott Series

The Talbott series consists of moderately deep, clayey, red soils that formed in material weathered from limestone. Slopes are 5 to 50 percent.

In a representative profile the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is yellowish-red, plastic clay which extends to limestone bedrock at a depth of about 35 inches.

Permeability is moderately slow, and available water capacity is medium. Reaction is strongly acid or medium acid in the upper part of the profile, but is less acid near the bedrock. Reaction is less acid where the surface layer has been limed. The soils respond fairly well to management.

Talbott soils are used mostly for pasture and hay. Many areas are idle or in forest. A few patches of corn, tobacco, and small grain are grown.

Representative profile of Talbott silt loam, 5 to 12 percent slopes, eroded:

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

B21t—7 to 15 inches, yellowish-red (5YR 4/6) clay; moderate, medium, subangular blocky structure; firm, plastic; few roots; continuous clay films; strongly acid; gradual, smooth boundary.

B22t—15 to 28 inches, yellowish-red (5YR 4/8) clay; strong, medium and fine, angular blocky structure; firm, plastic; continuous clay films; few fine chert fragments; strongly acid; gradual, smooth boundary.

B3—28 to 35 inches, yellowish-red (5YR 4/8) clay; moderate, fine and medium, angular blocky structure; firm, plastic; common coarse streaks of yellowish-brown saprolite; medium acid.

R—35 inches, limestone bedrock.

The Ap horizon is brown or yellowish-brown silt loam 4 to 8 inches thick. It ranges to yellowish-red silty clay loam or finer in severely eroded areas.

The B2t horizon is yellowish-red or red clay or silty clay. Bedrock is at a depth of 20 to 40 inches.

TbC2—Talbott silt loam, 5 to 12 percent slopes, eroded. This is a moderately deep, sloping, reddish, well-drained soil. It is on low uplands in the limestone valleys. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few, slightly less sloping, small areas of soils; a few areas of rock outcrop; and a few sinkholes. Also included are a few areas where there is less than 20 inches of soil material over rock.

This soil is only fairly well suited to most commonly grown crops, but it is well suited to pasture and hay. It is poorly suited to septic tank disposal systems. Capability unit IVe–3; woodland suitability group 3c2.

TbD2—Talbott silt loam, 12 to 25 percent slopes, eroded. This is a moderately steep, reddish, moderately deep soil. It is on short hillsides in the limestone valleys.

The surface layer is brown silt loam 4 to 6 inches thick. The subsoil is yellowish-red, plastic clay. Limestone bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are a few small, severely eroded areas of soils that have a reddish, clayey surface layer. Also included are a few rock outcrops and a few areas of a soil that is less than 20 inches thick over bedrock.

This soil is fairly well suited to pasture and hay. The clayey subsoil, moderately slow permeability, moderate depth to rock, and slope are the main concerns of management for both farm and nonfarm uses. Capability unit VIe–2; woodland suitability group 3c2.

ToD3—Talbott silty clay, 12 to 25 percent slopes, severely eroded. This is a clayey, moderately deep, moderately steep, well-drained soil on short hillsides.

The surface layer is yellowish-red silty clay about 4 inches thick. The subsoil is yellowish-red, firm, plastic clay. Limestone bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are a few rock outcrops, a few small gullied areas, and a few small areas of shallow clayey soils over limestone. Also included are a few areas of soils that have slopes of about 8 to 12 percent.

This soil is fairly well suited to pasture and woodland. The clayey subsoil, moderately slow permeability, limited depth, and moderately steep slopes are concerns of management. Capability unit VIe–2; woodland suitability group 4c3e.

TrD—Talbott-Rock outcrop complex, 5 to 20 percent slopes. This complex is on the limestone valley floors and on moderately steep hillsides near the edges of the valleys. It is 50 to 80 percent Talbott soils and 15 to 40 percent rock outcrop of massive limestone (fig. 18). Many areas are deeply pitted by limestone sinks.

The Talbott soils are between the outcrops. They have a surface layer of yellowish-brown to yellowish-red silty clay loam or clay. The subsoil is yellowish-red, plastic clay. Bedrock is at a depth of less than 3 feet.

Included with this complex in mapping are a few areas of a brownish, loamy soil at the center of sinks and depressions. Small strips or patches in some areas are nearly free of rock outcrop, and in other areas 50 or 60 percent of the surface is made up of bedrock outcrop. Also included are a few areas of rocky, moderately deep, loamy soils that are 20 to 35 percent, by volume, chert fragments.

Figure 18.—Area of Talbott-Rock outcrop complex, 5 to 20 percent slopes.

This complex is fairly well suited to pasture and woodland. The rocky surface is a limitation to clipping and other pasture maintenance operations. Capability unit VIs–1; woodland suitability group 4x3.

TrE—Talbott-Rock outcrop complex, 20 to 50 percent slopes. This rocky, clayey complex is on steep valley walls at the margins of the limestone valleys. It occurs as nearly continuous, horizontal bands on north-facing slopes of some high ridges. This complex is 15 to 35 percent Rock outcrop and 50 to 80 percent Talbott soils.

The Talbott soils are between the rock outcrops. They have a surface layer of brownish or yellowish silty clay or silty clay loam and a subsoil of yellowish-red or red, firm, plastic clay. Depth of the soils between the tilted rock layers is variable, but it is mostly 20 to 40 inches.

Included with this complex in mapping are a few areas of soils, near the base of steep slopes, that have a thick, dark surface layer. Also included are some areas where rock outcrops make up about 45 to 65 percent of the surface, and small areas of nonrocky, shallow, clayey soils.

This complex is poorly suited to pasture. It is fairly well suited to trees, including yellow-poplar and black walnut. Capability unit VIIs–1; woodland suitability group 4x3.

Wallen Series

The Wallen series consists of excessively drained, moderately deep, gravelly soils on steep sandstone and siltstone mountains. Slopes are 25 to 60 percent.

In a representative profile the surface layer is pale-brown gravelly loam about 6 inches thick. The subsoil is light yellowish-brown, very friable gravelly and cobbly loam; sandstone fragments make up about one-third to one-half of the volume. Hard sandstone bedrock is at a depth of 28 inches.

Permeability is moderately rapid, and available water capacity is low. Runoff is medium to rapid. Reaction is strongly acid or very strongly acid, and natural fertility is low.

Wallen soils are mainly in forest, dominantly of oaks, hickories, and Virginia pine. A few of the less steep areas are used for pasture.

Representative profile of Wallen gravelly loam, 25 to 60 percent slopes:

A2—0 to 6 inches, pale-brown (10YR 6/3) gravelly loam; weak, fine and medium, granular structure; very friable; many roots; about 25 percent, by volume, angular sandstone fragments, mostly 1 inch to 4 inches across, but a few up to 10 inches across; very strongly acid; gradual, smooth boundary.

B21—6 to 18 inches, light yellowish-brown (10YR 6/4) gravelly loam; weak, medium and fine, subangular blocky structure; very friable; common roots; about 35 percent, by volume, angular sandstone fragments, mostly 1 inch to 4 inches across, but a few up to 10 inches across; very strongly acid; gradual, smooth boundary.

B22—18 to 28 inches, light yellowish-brown (10YR 6/4) cobbly loam; weak, medium and fine, subangular blocky structure; very friable; common roots; about 45 percent, by volume, angular sandstone fragments 2 to 10 inches across; very strongly acid; clear, irregular boundary.

R—28 inches, hard sandstone rock; light yellowish-brown loam extends into a few small cracks.

The A2 horizon is brown or pale-brown gravelly loam, silt loam, or fine sandy loam.

The B horizon is light yellowish-brown, yellowish-brown, or brownish-yellow gravelly or cobbly loam, silt loam, or fine sandy loam.

Sandstone or acid siltstone bedrock is at a depth of 20 to 40 inches.

WaF—Wallen gravelly loam, 25 to 60 percent slopes. This is a gravelly, steep, excessively drained, moderately deep soil on mountainsides. It is underlain by sandstone and siltstone.

Included with this soil in mapping are narrow bands of a soil that is less than 20 inches deep over bedrock. Also included are narrow ridgecrests that have slopes of less than 25 percent.

This soil is fairly well suited to adapted trees and to such recreational uses as hiking and hunting. Capability unit VIIe–1; woodland suitability group 4f3.

WeF—Wallen-Rock outcrop complex, 25 to 60 percent slopes. This complex is on narrow, rough mountain crests and steep mountainsides. It is 25 to 50 percent Rock outcrop of sandstone bedrock and 40 to 70 percent Wallen soils.

The Wallen soils are between the outcrops. They have a surface layer of brown gravelly loam about 3 to 5 inches thick. Below this is 15 to 25 inches of yellowish-brown cobbly sandy loam. Bedrock is at a depth of 20 to 30 inches, except for a few small pockets that have deeper soil material. Reaction is strongly acid throughout the profile.

Included with this unit in mapping are a few areas where rock makes up more than 50 percent of the surface.

This mapping unit is poorly suited to trees. Only drought-tolerant trees can survive on it. It is fairly well suited to wildlife habitat and to such recreational uses as hiking and hunting. Capability unit VIIs–1; woodland suitability group 5x3.

Whitesburg Series

The Whitesburg series consists of moderately well drained, loamy soils along narrow local drainageways and on alluvial fans. The soils formed in material washed from the soils, on nearby hills, that are underlain by calcareous shale. Slopes are from 1 percent to about 5 percent.

In a representative profile the surface layer is brown silt loam 8 inches thick. The subsoil is about 22 inches thick. It is yellowish-brown, friable silt loam and silty clay loam and is underlain by mottled brownish, yellowish, and grayish silty clay loam. Shale bedrock is at a depth of 50 inches.

Permeability is moderate, and available water capacity is high. Reaction is slightly acid to mildly alkaline. The soils are subject to seepage from nearby shale hills and have a seasonally high water table.

Whitesburg soils are used mainly for pasture, hay, and silage. A few areas are used for corn and tobacco.

Representative profile of Whitesburg silt loam:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; many roots; few small shale fragments; neutral; abrupt, smooth boundary.

B2—8 to 16 inches, yellowish-brown (10YR 5/4) silt loam; few, fine, faint, grayish-brown mottles; weak, medium, subangular blocky structure; friable; common roots; few small shale fragments; neutral; clear, smooth boundary.

B3—16 to 30 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, faint, grayish-brown (2.5YR 5/2) mottles; weak, medium, subangular blocky structure; friable; few roots; few, small, black concretions; neutral; gradual, smooth boundary.

C—30 to 50 inches, mottled yellowish-brown (10YR 5/6), grayish-brown (2.5YR 5/2), and brown (7.5YR 4/4) silty clay loam; massive; friable; few roots; few, medium, reddish-brown and black concretions; neutral.

R—50 inches, hard, fissle, calcareous shale.

The A horizon is brown, dark grayish-brown, or dark yellowish-brown silt loam or silty clay loam. It is shaly silt loam in some profiles.

The upper part of the B horizon is silty clay loam or silt loam and has few to common shale fragments.

Shale bedrock is at a depth of about 40 to 60 inches.

Ws—Whitesburg silt loam. This is a moderately well drained soil along narrow, local drainageways and on alluvial fans. It formed in alluvium washed from soils of the nearby calcareous shale hills. Slopes are 1 to 5 percent.

Included with this soil in mapping are numerous, small, poorly drained wet spots at the toe of shale hills. Also included are a few small areas of soils that have a fragipan.

This soil is well suited to most commonly grown crops. Because the soil lies between steep hills, the main concern of management is to protect it from seepage and overwash from the adjacent hillsides. Capability unit IIw–1; woodland suitability group 2w8.

Whitwell Series

The Whitwell series consists of loamy, deep, moderately well drained soils on low stream terraces. These soils formed in mixed sediment washed mainly from soils underlain by sandstone, siltstone, and shale. Slopes range from 0 to 2 percent.

In a representative profile the surface layer is brown loam about 8 inches thick. The subsoil, to a depth of 42 inches, is yellowish-brown, friable loam and clay loam that has grayish mottles in the lower half. Below this is mottled, yellowish-brown, friable loam.

Permeability is moderate, and available water capacity is high. Some areas of this soil are subject to occasional, very brief flooding. Reaction is strongly acid, except where the surface layer has been limed. The soils are very easy to work and respond very well to management.

Whitwell soils are used for corn, small grain, tobacco, hay, and pasture. A few areas are being developed for residential subdivisions and sites for light industry.

Representative profile of Whitwell loam:

Ap—0 to 8 inches, brown (10YR 4/3) loam; weak, fine, granular structure; very friable; many roots; medium acid; abrupt, smooth boundary.

B1—8 to 13 inches, yellowish-brown (10YR 5/4) fine loam; weak, fine and medium, subangular blocky structure; friable; common roots; common fine pores; strongly acid; clear, smooth boundary.

B2t—13 to 26 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, grayish-brown (10YR 5/2) mottles in lower half; weak, medium, subangular blocky structure; friable; patchy clay films; few roots; strongly acid; clear, smooth boundary.

B3—26 to 42 inches, yellowish-brown (10YR 5/6) clay loam; many, medium, grayish-brown (10YR 5/2), light brownish-gray (10YR 6/2), and strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; friable; common, fine, black concretions; patchy clay films; strongly acid; gradual, smooth boundary.

C—42 to 55 inches, yellowish-brown (10YR 5/4) loam; common, medium, light brownish-gray (10YR 6/2) and few, medium, very dark grayish-brown (10YR 3/2) mottles; massive; friable; common, fine, black concretions; strongly acid.

The Ap horizon is brown, dark grayish-brown, or dark yellowish-brown loam or silt loam 5 to 10 inches thick.

The B horizon is yellowish-brown, strong-brown, or brown loam or clay loam mottled with shades of gray and brown.

The C horizon in some places is gravelly, and in a few places it is cobbly. It is loam, sandy loam, or clay loam.

Shale or limestone bedrock is at a depth greater than 5 feet.

Wt—Whitwell loam. This is a deep, loamy, nearly level, moderately well drained soil. It is on low stream terraces.

Included with this soil in mapping are a few small areas of a deep, loamy, well-drained soil that lacks gray mottles in the subsoil. Also included are a few small pockets of a somewhat poorly drained soil that is mainly gray in the subsoil.

This soil is very well suited to most commonly grown crops. Stands of alfalfa may be somewhat short-lived because the water table is seasonally high. The seasonally high water table and occasional, very brief flooding in areas are the main concerns of management. Capability unit IIw–1; woodland suitability group 2w8.

Use and Management of the Soils

This section describes the use and management of the soils for crops and pasture, for woodland, and for wildlife habitat. It also discusses uses of the soils for engineering purposes.

Crops and Pasture [3]

The soils of Hawkins and Hancock Counties are used mainly for farming. The largest acreages are used for pasture and hay. Small acreages of corn, small grain, tobacco, and vegetable crops are grown. This section explains the capability grouping used by the Soil Conservation Service, describes management by capability units, and gives estimated yields of the principal crops grown in the county.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

[3] CLARENCE H. JUNT, JR., agronomist, Soil Conservation Service, helped to prepare this section.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife habitat. (None in Hawkins and Hancock Counties.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (None in Hawkins and Hancock Counties.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils, the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture or range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–2 or IIIe–4. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

Suggestions for the use and management of the soils of Hawkins and Hancock Counties by capability unit are given in the following pages. Specific statements are not made concerning the use of fertilizer, desirable varieties and mixtures of seeds, or favorable dates for planting. Up-to-date information is published from time to time by the Tennessee Agricultural Experiment Station and the Extension Service. Personnel of the local office of the Soil Conservation Service and the Extension Service can furnish information helpful in interpreting this information.

The capability unit designation for each soil in the survey area is given in the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1

This unit consists of deep, level, very friable loams and silt loams that have a subsoil of friable or very friable silt loam, loam, or clay loam. These soils are on bottom lands or along drainageways and are subject to flooding.

Available water capacity is high. Roots penetrate to a depth of 4 feet or more. Fertility is moderate to high.

These soils are well suited to commonly grown crops and can be farmed intensively. They are easy to work. The response to management is excellent. They are generally not used for pasture, but their high available water capacity makes them especially well suited to supplemental summer pasture. Alfalfa generally does not survive so long on these soils as on the soils on uplands. Practically all the acreage is cultivated. Much of it is used for corn and hay. Small acreages are used for tobacco.

The soils in this unit can be row cropped every year because they are level and are not subject to erosion. Plowing under large amounts of residue replenishes the supply of organic matter and preserves tilth. Fertilization is important.

CAPABILITY UNIT IIe-1

This unit consists of deep, well-drained, gently sloping loams and silt loams. They are moderately permeable. The root zone is thick and is easily penetrated by air, water, and roots. Available water capacity is high.

These soils are very well suited to commonly grown crops. The response to management is good. If adequately limed, fertilized, and otherwise well managed, they can be farmed moderately intensively. They can be used for row crops as much as 50 percent of the time but not for more than 2 years in succession.

These soils can be conserved and kept productive by use of a suitable cropping system, adequate fertilization, and good water management. Contour cultivation helps to control erosion. On long slopes, the hazard of erosion can be reduced by terracing or contour stripcropping. Diversions protect areas that receive excess runoff from steep slopes. Natural draws provide excellent sites for sodded waterways.

CAPABILITY UNIT IIe-2

This unit consists of moderately well drained, gently sloping silt loams and loams that have a fragipan at a depth of about 24 inches. Roots, air, and water can penetrate as far as the fragipan. During periods of heavy

rainfall, the 4- to 10-inch layer above the fragipan is waterlogged. During long dry periods, the soils dry out and most crops and pasture plants are damaged.

These soils are easy to work. If fertilized and otherwise well managed, they are moderately well suited to all commonly grown crops. They are well suited to tall fescue, white clover, annual lespedeza, and sericea lespedeza for hay and pasture. Their suitability for corn and tobacco varies considerably from year to year, depending on the amount of rainfall. Alfalfa generally does not last more than 2 or 3 years, because of the fragipan and seasonal wetness in the layer above the pan. Selecting plants that can tolerate both excess water and drought partly overcomes these limitations.

A suitable cropping system and good water management practices reduce runoff and help to control erosion. A short cropping system is best. Row crops can be grown as much as 50 percent of the time but not for more than 2 years in succession. With minimum tillage, row crops can be grown year after year. Contour cultivation, terraces, contour stripcropping, residue management, and winter cover crops are effective in erosion control. Residue and winter cover crops also help to preserve tilth. Diversion ditches and vegetated draws help to carry away excess runoff. Carefully controlled grazing prevents damage from trampling.

CAPABILITY UNIT IIs-1

Sensabaugh gravelly loam is the only soil in this unit. It is nearly level, well drained, and friable and is along narrow drainageways and on toe slopes. It contains about 20 to 30 percent, by volume, siltstone and sandstone gravel and thin, flat rock fragments. These coarse fragments interfere with tillage and reduce the available water capacity. Most areas, however, receive some water as underground seepage from the adjacent ridges.

The soil is friable and permeable. Available water capacity is fairly high. Most areas are subject to occasional, brief flooding.

This soil is easy to work. It is suited to most commonly grown crops and can be row cropped every year. Alfalfa and tobacco may be damaged by flooding and sedimentation in some areas.

Deepening drainage channels, establishing natural drainageways as sod waterways, and using diversions at the base of steeper upland slopes can reduce damage from flooding and sedimentation in most areas. Fertilization and liming are important for good growth of crops.

CAPABILITY UNIT IIw-1

This unit consists of moderately well drained, fertile silt loams and loams on first bottoms and on low terraces. Most of these soils are occasionally flooded for very brief periods. Flooding occurs mostly in winter and early in spring. Planting is sometimes delayed by excess moisture. Available water capacity is high.

These soils are well suited to soybeans, grain sorghum, tall fescue, white clover, and lespedeza. They are well suited to supplemental summer pasture from plants such as the pearl millets or sudan-sorghum hybrids. Corn grows well, but in places planting is delayed because of wetness. Small grain and soybeans can be grown in areas where surface drainage is good and ponding or flooding is not severe. Response to management is good.

These soils can be row cropped every year because they are level and not subject to erosion. In many places, a system of open drainage ditches and diversion ditches improves surface and internal drainage. Plowing under large amounts of residue replenishes the supply of organic matter and preserves tilth.

CAPABILITY UNIT IIIe-1

This unit consists of deep, friable, well-drained, gently rolling loams and silt loams on uplands and terraces. These soils are easily penetrated by air, water, and roots.

Available water capacity is high or moderate.

If fertilized and otherwise well managed, these soils are suited to many crops, including corn, tobacco, small grain, lespedeza, white clover, alfalfa, orchardgrass, and tall fescue. They are well suited to most commercial nursery plants. The plow layer is easy to work. Response to management is good.

Controlling erosion is the main concern of management. A suitable cropping system, adequate fertilization, and other good management techniques are needed. A suitable cropping system is a row crop followed by a small grain, then pasture or hay for 2 years or more, or else a row crop followed by alfalfa for 4 years. These rotations work well in stripcropping systems. The use of no-tillage cropping systems allows these soils to be row cropped more often. Vetch, crimson clover, or small grain are effective green-manure and winter-cover crops because they replenish the supply of organic matter and protect the soils against erosion. Plowing under crop residue helps to control erosion and preserve tilth. Diversions, stripcropping, terraces, and contour cultivation also are effective in erosion control. In many places, natural draws provide excellent sites for grassed waterways.

CAPABILITY UNIT IIIe-2

This unit consists of deep, well-drained upland soils that have a silt loam surface layer and a clayey subsoil. Slopes are 5 to 12 percent. The soils are moderately permeable to air, water, and plant roots. Available water capacity is medium or high.

These soils are suited to all locally grown crops; they should not be frequently cultivated, however, because of the hazard of erosion. They are especially well suited to perennial hay and pasture plants such as alfalfa, orchardgrass, or tall fescue. Proper liming and fertilization are important, particularly when growing alfalfa. A row crop once every 3 or 4 years followed by hay or pasture is a suitable cropping system.

Growing a row crop every 3 or 4 years, along with suitable water management practices such as diversions, contour cultivation, and stripcropping, are effective in controlling erosion. The minimum tillage practice of no-tillage, using a surface mulch of crop residue, permits more intensive use of these soils for row crops without appreciable soil deterioration. Close-growing perennial vegetation established in natural drainageways provides for the safe removal of runoff water.

CAPABILITY UNIT IIIe-3

Fullerton cherty silt loam, 5 to 12 percent slopes, is the only soil in this unit. It is deep, well drained, and cherty or gravelly. Numerous angular chert fragments or pebbles are on the surface and throughout the profile. The root zone is deep. Available water capacity is medium.

When this soil is adequately fertilized and otherwise well managed, it is moderately well suited to tobacco, small grain, annual and perennial lespedeza, and pasture plants. A good management system is to grow a row crop every 3 or 4 years and hay or pasture crops the rest of the time. Under good management, this soil is suited to the commonly grown cool-season grasses and legumes. Applications of a complete fertilizer are needed for most crops and pasture mixtures. Boron is needed to maintain good stands of alfalfa .

Growing a row crop every 3 or 4 years and using good management practices, such as diversions, contour cultivation, and stripcropping, are effective in controlling erosion. In many places, these soils can be used more intensively for row crops without appreciable soil deterioration if they are no-tilled and a surface mulch of crop residue is used. Close-growing vegetation established in natural drainageways provides for the safe removal of runoff water.

CAPABILITY UNIT IIIe-4

Needmore silt loam, 2 to 5 percent slopes, is the only soil in this unit. It has a surface layer of silt loam and a slowly permeable, clayey subsoil underlain by shale rock at a depth of 20 to 40 inches. It is on gently sloping uplands. This soil is well drained. Available water capacity is medium, and natural fertility is low. Root development is largely confined to the thin, loamy surface layer, but perennials, such as alfalfa and fescue, can send roots into the clayey subsoil. Water penetrates the soil moderately slowly, resulting in high runoff.

Cool-season crops such as small grain, legumes, and grasses respond well to application of fertilizer and to other good management practices. Yields of summer annuals are usually limited by the shortage of moisture. Close-growing crops such as alfalfa, tall fescue, ryegrass, and white clover should be grown on these soils most of the time. If a row crop is grown, it should be grown after the soil has been 3 or 4 years in sod. A suitable cropping system is a row crop followed by small grain and then 2 years or more of hay or pasture.

If this soil is adequately fertilized, the yield of crop residue is increased. If crop residue is properly mixed with the surface layer, it protects the soil from excessive erosion and helps to maintain good tilth and organic-matter content. Contour cultivation or stripcropping is effective in controlling erosion if row crops are grown. These practices conserve moisture and thereby increase yields. In places diversions are needed to concentrate runoff water and move it to suitable outlets. Drainageways for the removal of runoff water should be established and maintained in perennial vegetation.

CAPABILITY UNIT IIIe-5

This unit consists of moderately well drained soils that have a fragipan at a depth of about 24 inches. The fragipan restricts growth of roots and movement of air and water. Excess water accumulates above the fragipan during wet periods, and the soils dry out rapidly during dry periods. Slopes range from 5 to 12 percent.

The slowly permeable layer in the profile of these soils somewhat limits their use. Suitable crops are grain sorghum, tobacco, small grain, tall fescue, sericea lespedeza, and annual lespedeza. Small grain grows and matures during periods of ample rainfall and therefore is well suited. Stands of alfalfa generally do not survive long on these soils. Soils of this unit are well suited to pasture and hay when established to suitable forage plants.

These soils are difficult to manage because of their compact subsoil layer and slope. They erode easily. If they are used for row crops, then contour cultivation, stripcropping, or terraces, or a combination of these practices, is effective in retarding runoff and reducing soil loss. Managing crop residue and using residue for surface mulch with such no-tillage produced crops as corn or grain sorghum reduce soil loss and runoff to safe levels on these soils. Diversions are needed in places to carry excess water to protected outlets. Natural drainageways should be established in perennial vegetation to remove runoff water without excessive erosion. These soils respond fairly well to applications of lime and fertilizer. Small but frequent applications of fertilizer give the best response.

CAPABILITY UNIT IIIw-1

This unit consists of poorly drained soils on bottom lands. Most of the areas are subject to short periods of flooding or ponding, and they stay wet until late in spring.

Wetness in these soils is caused by a high water table, seepage from adjacent slopes, and flooding. As a result, planting is delayed from a few days to several weeks in spring. During summer the soils dry out and plant roots are able to penetrate the previously waterlogged soils. The roots grow too slowly, however, to benefit from the drying and are usually limited to the upper 20 inches of the soil.

Grain sorghum, soybeans, and annual lespedeza are suited to these soils. Water-tolerant pasture plants, such as tall fescue, white clover, and alsike clover, also are suited. The grazing season is limited to late spring, summer, and early fall.

If the soils are adequately drained, corn, grain sorghum, soybeans, and other row crops can be grown every year. Harvest in fall, however, is sometimes hindered by excessive wetness. If suitable outlets are available, a system of open ditches removes surface water and lowers the water table somewhat. Tile drains are also effective. Tilling within a narrow range of moisture content is important on these soils to prevent hard clods from forming as the soil dries. Flooding along small drainageways can often be reduced by alining stream channels and by clearing, shaping, and establishing perennial plants on the streambanks.

These soils can be used continuously for crops because erosion is not a serious hazard. If they are adequately fertilized, fairly large amounts of crop residue are available for return to the soil, which helps to maintain good tilth.

CAPABILITY UNIT IIIw-2

Taft silt loam is the only soil in this unit. It is somewhat poorly drained and has a poorly aerated subsoil.

This soil has a surface layer of silt loam and is fairly easy to work, but it is saturated in winter and spring and, in places, is ponded for short periods. In summer and fall it generally dries out and is somewhat droughty.

Under natural drainage, crop failures are common. If artificially drained, the soils are fairly well suited to corn, grain sorghum, and soybeans. Tall fescue, common bermudagrass, white clover, and annual lespedeza are

suitable hay and pasture plants. Deep-rooted legumes, such as alfalfa, are poorly suited. The soil is easily damaged by overgrazing when it is dry and by trampling when it is wet.

Wetness is the main limitation. It often delays tillage in spring and harvest in fall. It can be overcome if crops are selected that tolerate wetness and if open ditches are used to remove surface water from pockets and low areas where suitable outlets are available. In places tile drainage is not effective, because of slow internal water movement.

Row crops can be grown every year because the soil is nearly level and is not likely to erode. Large amounts of fertilizer should be applied and stalks and stubble plowed under to replenish the supply of organic matter and to preserve tilth.

CAPABILITY UNIT IVe-1

This unit consists of deep, well-drained soils that have a loamy surface layer and a subsoil of silty clay loam, clay loam, or clay. Slopes range from 10 to 25 percent.

The root zone is deep, and available water capacity is moderate to high. Reaction is very strongly acid to medium acid, and natural fertility is medium to low. Erosion is a severe hazard if the soils are cultivated.

Corn, tobacco, alfalfa, tall fescue, orchardgrass, red clover, white clover, and lespedeza can be grown on these soils. The soils are well suited to improved pasture. They can be grazed any time during the year because they do not become excessively wet. Crops respond well to additions of fertilizer and lime and to other management practices.

Controlling further erosion is the main concern of management. Soil and water losses can be reduced if a suitable cropping system, proper fertilization, and good water management practices are used. Such practices include contour cultivation, stripcropping, and the use of diversions and grassed waterways. A suitable cropping system is one that includes a row crop one-fourth of the time and grasses and legumes the rest of the time. When these soils are used more intensively, soil loss and runoff are greatly reduced if the soils are no-tilled and residue from a close-growing crop is used as a surface mulch.

CAPABILITY UNIT IVe-2

This unit consists of deep, well-drained, and cherty, cobbly, or gravelly soils. Slopes range from 5 to 20 percent.

The root zone is deep, and available water capacity is moderate to low. Content of chert fragments or of gravel and cobbles in the soil ranges from about 15 to 25 percent, by volume. Reaction is strongly acid, and natural fertility is low.

Most of the commonly grown crops and pasture plants are moderately well suited to these soils. Because of summer drought, susceptibility to erosion, and the difficulty of using farm machinery, these soils are better suited to pasture or hay than to row crops. All common grasses and legumes, such as tall fescue, orchardgrass, white clover, red clover, and alfalfa can be grown. Summer annual plants, such as annual lespedeza and Sudan-sorghum hybrids, are not well suited. If row crops are grown, a suitable cropping system includes a cultivated crop 1 year out of 4 to 6 years and perennial pasture or hay the rest of the time. No-tilling for corn and sorghum allows more intensive use of these soils, provided there is a good surface mulch of plant residue.

On these soils, contouring, stripcropping, and diversions are effective in retarding runoff and in controlling further erosion. All natural drainageways should be established and maintained in perennial vegetation to control runoff. On steeper slopes, it is often desirable to establish or reestablish pasture or hay plants in alternate contoured strips.

CAPABILITY UNIT IVe-3

This unit consists of moderately deep, well-drained soils that have a dense, clayey subsoil. Shale or limestone rock is at a depth of 20 to 40 inches. Slopes range from 3 to 12 percent.

These soils are moderately well suited to poorly suited to corn, tobacco, and other row crops. Small grain is a suitable crop because ample moisture is available during its growing season. These soils are moderately well suited to most pasture and hay grasses and legumes. With good management, tall fescue, bermudagrass, white clover, annual lespedeza, and sericea lespedeza grow moderately well. Alfalfa can be grown, but good stands are somewhat difficult to establish and maintain.

Water management practices are very important on these soils. Diversions, stripcropping, and contour cultivation should be used for cultivated crops. Small grain or some other winter annual should follow any row crop grown on these soils in order to provide ground cover until perennial plants are reestablished.

These soils should not be cultivated more than 1 year out of 4 to 6, if they are cultivated at all. Tillage operations should be performed within a narrow range of moisture conditions. Plowing under cover crops and returning crop residue to the soil help to maintain soil tilth. The results of soil analyses should always be used to determine lime and fertilizer needs.

CAPABILITY UNIT IVw-1

Guthrie silt loam is the only soil in this unit. It is on uplands and in depressions. It has a fragipan at a depth of about 30 inches. The fragipan limits growth of roots and the movement of air and water. Runoff is slow, and in many places ponding is common. The soil is generally saturated in winter and spring and is extremely dry during prolonged dry periods in summer and fall. Fertility is low. Response to lime and fertilizer is generally good.

In most areas this soil is poorly suited to row crops. If adequately drained, it is suited to soybeans or other summer annuals that can be planted late in spring and harvested early in fall. In places waterlogging delays or prevents harvesting and the use of heavy machinery.

This soil is well suited to water-tolerant permanent pasture. It is suited to tall fescue, reed canarygrass, white clover, and annual lespedeza. It is easily worked when it contains the proper amount of moisture. It is not subject to erosion. Where suitable outlets are available, open ditches can remove excess water on the surface. Wooded areas should remain in trees unless needed for other purposes.

CAPABILITY UNIT VIe-1

This unit consists of deep, well-drained, moderately steep and steep soils on uplands. Permeability is mainly moderate, and available water capacity is medium to high.

Because slopes are strong and erosion is a hazard, these soils are poorly suited to crops that require tillage, but they are suited to permanent pasture and hay. Orchardgrass, tall fescue, common bermudagrass, white clover, red clover, and annual lespedeza are among the commonly grown grasses and legumes.

Controlling runoff to reduce erosion is the main concern of management. Well-fertilized grasses and legumes provide hay and pasture and, unless they are overgrazed or mowed too closely, they reduce runoff and erosion. A grass-legume mixture is more effective than a legume alone. The soils can be grazed in winter because they are not wet or soft. These soils should be plowed only to reseed pasture or hay. Establishing or renovating pasture or hay in alternate contour strips reduces erosion. Brush and weed control is especially important in pasture management because many areas revert easily to locust and other woody plants.

CAPABILITY UNIT VIe-2

This unit consists of sloping to steep soils that have a dense clayey subsoil. They are moderately deep over bedrock. The plow layer is thin and contains some subsoil material. There are a few outcrops of limestone in some of the areas. Slopes range from 5 to 25 percent.

These soils are highly susceptible to erosion. They are poorly suited to crops that require tillage. Runoff is medium or rapid because of the slope and the moderately slow permeability in the clayey subsoil. Selected crops can be grown occasionally in some areas, but special practices and very careful management are needed to control erosion.

Generally, good seedbeds are difficult to prepare and good stands are difficult to establish and maintain, particularly in the more eroded areas. In places limestone outcrops on the surface make seedbeds difficult to prepare. Establishing or renovating pasture or hay in alternate contour strips helps to control erosion.

CAPABILITY UNIT VIe-3

This unit consists of well-drained to excessively drained, droughty, shaly soils. Slopes range from 5 to 35 percent. Available water capacity is low, and productivity is low.

These soils are poorly suited to tilled crops, even in the less sloping areas. The use of these soils is limited to perennial grasses and legumes for pasture and for hay in some selected areas. In other areas native plants should be allowed to regenerate and native pasture management practices should be applied.

If they are adequately fertilized and otherwise well managed, the soils in some selected areas are moderately well suited to tall fescue, weeping lovegrass, common bermudagrass, sericea lespedeza, and annual lespedeza for forage in spring and early in summer. Droughtiness reduces growth of forage to a small amount for the rest of the year.

Diversions and grassed waterways are needed in places to control runoff. Pasture on the steeper, longer slopes should be established or reestablished in alternate contour strips, and this should take 2 years.

CAPABILITY UNIT VIs-1

This unit consists of only Talbott-Rock outcrop complex, 5 to 20 percent slopes. It consists of small areas of a fine-textured soil among outcrops of limestone bedrock. The outcrops extend from a few inches to 2 or 3 feet above the land surface.

The outcrops of rock limit mowing and pasture maintenance. Hand tools commonly must be used. Generally, there are too many outcrops for this land to be used for cultivation.

Suitable plants for pasture are tall fescue, common bermudagrass, bluegrass, white clover, and annual lespedeza. In places it is more profitable to manage existing native plants than it is to prepare seedbeds and establish stands of pasture. Carefully controlled grazing is a very important management practice.

CAPABILITY UNIT VIIe-1

This unit consists of steep and very steep soils. Slopes range from 25 to 60 percent. Available water capacity is low to medium. There are common to many fragments of shale, chert, or sandstone throughout the profile.

These soils are better suited to trees than to field crops or pasture plants. Some tracts are used for pasture because there are few better sites on some farms. Some of the less steep and less eroded areas produce some forage from plants such as common bermudagrass, tall fescue, bluegrass, and annual lespedeza. Information about the use of these soils for trees can be found in the section "Woodland."

CAPABILITY UNIT VIIs-1

This unit consists of steep soils on hillsides. Many outcrops of bedrock or large amounts of loose stones are on the surface and in the profile. All soils in this unit are too steep and too rocky or stony to cultivate.

These soils are mostly in trees. Cleared areas should be reforested. Information about use of these soils for trees can be found in the section "Woodland."

Estimated yields

Table 4 lists estimated yields of the principal crops grown in Hawkins and Hancock Counties. Yields are given under two levels of management. The yields in columns A are expected under common or prevailing management; those in colums B are expected under the improved management defined below. Under prevailing management, yields are generally 30 to 40 percent lower than those obtained under improved management. Estimates are not listed if the soil is generally not planted to the crop or is not suited to it.

The estimates in columns B are based on yield data obtained through long-term experiments; on records of crop yields on farms that are cooperating in a study of soil productivity and management; and on information obtained from agronomists and soil scientists who have had experience with the crops and soils in the survey area.

Data for yields obtained from experimental plots were adjusted to reflect the combined effect of slope, weather, and level of management. If such data were not available, estimates were made from data for similar soils. The estimates are averages of long-term annual yields obtained from nonirrigated soils. The overflow hazard of soils on bottom land was not considered, because the effects of flooding vary from place to place.

The management needed to obtain yields similar to those listed in columns B, table 4, includes the following practices:

TABLE 4.—*Estimated average yields per acre of principal crops under two levels of management*

[Yields in columns A are those obtained under common management; those in columns B are to be expected under a high level of management. Absence of yield data indicates crop is not suited to the soil or is not commonly grown on it]

Soil	Corn		Burley tobacco		Wheat		Alfalfa		Lespedeza		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Lb*	*Lb*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days*[1]	*Cow-acre-days*[1]
Allen loam, 5 to 12 percent slopes	50	80	1,800	2,300	28	45	2.0	3.2	1.0	1.6	110	185
Allen loam, 12 to 20 percent slopes	48	75	1,750	2,050	28	40	2.0	3.0	.9	1.4	110	175
Allen loam, 20 to 35 percent slopes									.7	1.2	100	160
Altavista silt loam	60	90	1,600	1,800	26	42	1.8	2.4	1.0	1.6	115	185
Bland-Rock outcrop complex, 20 to 40 percent slopes											45	80
Bouldin cobbly loam, 20 to 60 percent slopes												
Calvin silt loam, 15 to 35 percent slopes											60	100
Calvin silt loam, 35 to 60 percent slopes												
Calvin-Wallen complex, 25 to 60 percent slopes												
Claiborne silt loam, 5 to 12 percent slopes	55	85	1,600	2,200	28	45	2.2	3.4	1.1	1.7	130	200
Claiborne silt loam, 12 to 25 percent slopes	50	75	1,600	2,100	25	42	2.1	3.1	1.0	1.5	125	180
Claiborne silt loam, 25 to 40 percent slopes											110	160
Claiborne soils, 15 to 35 percent slopes, severely eroded											80	130
Clarksville cherty silt loam, 5 to 20 percent slopes											40	70
Clarksville cherty silt loam, 20 to 40 percent slopes											40	65
Cloudland loam, 2 to 5 percent slopes	50	75	1,700	1,900	28	42	1.8	2.2	.9	1.4	120	185
Cloudland loam, 5 to 12 percent slopes	48	70	1,700	1,900	28	42	1.8	2.2	.9	1.3	120	175
Cynthiana flaggy silty clay loam, 5 to 20 percent slopes											55	80
Cynthiana flaggy silty clay loam, 20 to 50 percent slopes											50	70
Dandridge shaly silty clay loam, 5 to 20 percent slopes											85	125
Dandridge shaly silty clay loam, 20 to 35 percent slopes											80	120
Dandridge shaly silty clay loam, 35 to 60 percent slopes												
Decatur silt loam, 5 to 12 percent slopes	55	70	1,550	1,750	30	45	2.2	3.4	.7	1.3	120	190
Decatur silt loam, 12 to 20 percent slopes	45	65	1,500	1,650	28	43	2.0	3.2	.7	1.2	110	180
Dewey silt loam, 5 to 12 percent slopes	50	70	1,550	1,750	28	45	2.2	3.4	.7	1.3	115	180
Dewey silt loam, 12 to 20 percent slopes	45	60	1,500	1,650	26	43	2.0	3.2	.7	1.2	110	170
Dunmore silt loam, 5 to 12 percent slopes	45	65	1,600	1,750	28	45	2.5	3.6	.7	1.3	115	180
Dunmore silt loam, 12 to 20 percent slopes	45	60	1,500	1,700	25	43	2.4	3.3	.7	1.2	110	165
Dunmore silt loam, 20 to 35 percent slopes											100	160
Dunmore silty clay loam, 12 to 25 percent slopes					22	32	1.6	2.6	.5	.7	90	135
Dunning silty clay loam	45	60							1.0	1.5	140	200
Ealy loam	55	90	1,600	1,800	24	38	1.8	2.6	1.1	1.8	135	210
Emory silt loam	75	115	1,700	2,200	25	45	2.1	3.3	1.4	2.0	145	210
Etowah silt loam, 2 to 5 percent slopes	60	95	1,800	2,300	34	48	2.2	3.4	1.1	1.8	140	220
Etowah silt loam, 5 to 12 percent slopes	55	85	1,800	2,200	34	45	2.2	3.3	1.0	1.7	140	210
Etowah silt loam, 12 to 25 percent slopes	45	75	1,750	2,000	28	38	2.0	3.0	.9	1.5	135	200
Fullerton cherty silt loam, 5 to 12 percent slopes	40	62	1,500	1,750	30	42		2.5		1.2	110	180
Fullerton cherty silt loam, 12 to 20 percent slopes	40	58	1,450	1,650	27	38		2.4		1.1	90	165
Fullerton cherty silt loam, 20 to 35 percent slopes											85	150
Gilpin silt loam, 25 to 50 percent slopes												
Greendale silt loam	65	105	1,900	2,300	25	45	2.0	3.2	1.4	2.0	150	220
Guthrie silt loam	35	55							.8	1.4	95	160
Hamblen silt loam	60	90			22	34	1.7	2.4	1.3	2.0	145	220
Hartsells loam, 3 to 12 percent slopes	40	70	1,600	2,000	25	38	1.5	2.2	.7	1.4	100	160
Hartsells loam, 12 to 20 percent slopes					24	34	1.3	2.0	.6	1.2	90	150
Hayter loam, 3 to 12 percent slopes	60	94	1,700	2,200	30	45	2.0	3.2	1.0	1.7	130	210
Hayter loam, 12 to 20 percent slopes	60	85	1,700	2,000	28	42	2.0	3.0	.9	1.5	125	190
Hayter loam, 20 to 35 percent slopes											125	185
Hayter cobbly loam, 10 to 20 percent slopes	50	70	1,650	1,800	26	40	2.0	3.0	.7	1.3	120	180
Hayter cobbly loam, 20 to 35 percent slopes											110	165
Hayter cobbly loam, 35 to 55 percent slopes												
Holston loam, 2 to 5 percent slopes	60	100	1,750	2,300	30	50	2.0	3.0	.9	1.6	125	210
Holston loam, 5 to 12 percent slopes	55	85	1,700	2,200	30	48	2.0	3.0	.9	1.5	125	200
Holston loam, 12 to 20 percent slopes	50	80	1,700	2,000	28	45	1.9	2.8	.7	1.3	120	190
Holston-Urban land complex. Too variable to rate.												
Jefferson loam, 5 to 12 percent slopes	50	82	1,800	2,150	28	48	2.0	2.9	.7	1.3	110	190
Jefferson loam, 12 to 20 percent slopes	45	70	1,750	1,900	25	43	1.9	2.7	.6	1.1	100	180
Jefferson cobbly loam, 5 to 12 percent slopes	45	70	1,700	1,900	27	43	1.8	2.4	.6	1.1	90	165
Jefferson cobbly loam, 12 to 20 percent slopes	40	65	1,650	1,800	25	38	1.7	2.1	.6	1.0	90	160
Jefferson cobbly loam, 20 to 35 percent slopes												
Leadvale silt loam, 2 to 5 percent slopes	55	75	1,700	1,900	28	42	1.6	2.4	.8	1.4	115	180
Leadvale silt loam, 5 to 12 percent slopes	55	70	1,700	1,900	26	42	1.6	2.4	.8	1.3	110	165
Leesburg gravelly loam, 10 to 20 percent slopes	45	60	1,600	1,700	26	38	1.4	2.0	.7	1.1	95	150
Lehew channery loam, 25 to 60 percent slopes												
Lindside silt loam	65	105			24	38	1.7	2.4	1.3	2.0	150	220

TABLE 4.—*Estimated average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn		Burley tobacco		Wheat		Alfalfa		Lespedeza		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Lb*	*Lb*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days*[1]	*Cow-acre-days*[1]
Litz shaly silt loam, 8 to 20 percent slopes			1,400	1,600	18	32	1.0	1.8	0.5	0.8	75	125
Litz shaly silt loam, 20 to 35 percent slopes											70	120
Litz shaly silt loam, 20 to 35 percent slopes, severely eroded												
Litz shaly silt loam, 35 to 60 percent slopes											60	105
Melvin silt loam	50	65							1.1	1.7	105	170
Minvale silt loam, 2 to 5 percent slopes	55	80	1,800	2,200	30	45	2.0	3.2	.8	1.4	130	200
Minvale silt loam, 5 to 12 percent slopes	52	75	1,800	2,100	30	45	2.0	3.1	.8	1.3	130	190
Minvale silt loam, 12 to 20 percent slopes	50	70	1,700	1,900	28	42	2.0	3.0	.7	1.2	120	180
Montevallo shaly silt loam, 8 to 25 percent slopes											55	90
Montevallo shaly silt loam, 25 to 50 percent slopes											40	70
Montevallo-Talbott complex, 20 to 45 percent slopes				293								
Needmore silt loam, 2 to 5 percent slopes	40	55	1,600	1,750	28	45	1.9	2.8	.8	1.3	110	160
Needmore silt loam, 5 to 12 percent slopes	40	48	1,550	1,650	28	43	1.9	2.7	.8	1.1	110	155
Nella cobbly loam, 5 to 12 percent slopes	50	60	1,600	1,900	28	38	1.8	2.8	.9	1.4	95	165
Nella cobbly loam, 12 to 20 percent slopes					24	35			.8	1.2	90	150
Nella cobbly loam, 20 to 45 percent slopes											80	140
Rock outcrop-Talbott complex, 10 to 40 percent slopes											35	45
Sensabaugh gravelly loam	60	75	1,900	2,200	32	45	2.2	3.2	1.1	1.5	150	210
Sequatchie loam	60	110	1,850	2,300	30	48	2.0	2.5	1.1	1.8	135	225
Sequoia silt loam, 3 to 12 percent slopes, eroded	40	52	1,550	1,700	26	40	1.8	2.8	.7	1.2	95	150
Sequoia silt loam, 12 to 20 percent slopes, eroded	35	45	1,400	1,600	22	38	1.7	2.6	.5	1.0	85	135
Sewanee loam	50	75			20	30			1.1	1.7	125	200
Shouns silt loam, 3 to 12 percent slopes	54	85	1,800	2,300	30	45	2.0	3.3	1.0	1.7	140	210
Shouns silt loam, 12 to 25 percent slopes	48	70	1,800	2,100	26	38	2.0	3.0	.9	1.5	135	200
Staser silt loam	75	115	1,900	2,200	35	48	2.0	3.3	1.3	2.0	165	230
Statler silt loam	75	110	1,900	2,300	35	48	2.0	3.5	1.3	2.0	160	210
Sullivan loam	75	110	1,900	2,200	35	48	2.0	3.3	1.3	2.0	160	230
Taft silt loam	40	60			20	36			.7	1.3	100	170
Talbott silt loam, 5 to 12 percent slopes, eroded	32	45	1,350	1,500	26	42	1.7	2.6	.6	1.0	90	135
Talbott silt loam, 12 to 25 percent slopes, eroded							1.6	2.4	.5	.9	80	125
Talbott silty clay, 12 to 25 percent slopes, severely eroded											50	100
Talbott-Rock outcrop complex, 5 to 20 percent slopes											40	80
Talbott-Rock outcrop complex, 20 to 50 percent slopes											35	70
Wallen gravelly loam, 25 to 60 percent slopes												
Wallen-Rock outcrop complex, 25 to 60 percent slopes												
Whitesburg silt loam	50	70			25	32			1.4	2.0	145	225
Whitwell loam	50	85	1,400	1,600	25	38	1.5	2.0	1.1	1.8	135	210

[1] Number of days in one year that 1 acre will provide grazing for one cow, one steer, one horse, five swine, or seven sheep without injury to the pasture.

1. Applying fertilizer according to the needs indicated by soil tests and by past cropping and fertilization practices. This refers especially to need for phosphorus, potassium, calcium, and minor elements.
2. Selecting high-yielding varieties of crops suited to the soil.
3. Preparing an adequate seedbed.
4. Planting or seeding by suitable methods at an appropriate rate and at the right time.
5. Inoculating legumes.
6. Using shallow cultivation for row crops.
7. Controlling weeds, insects, and diseases.
8. Using the cropping systems suggested in the section on management by capability units.
9. Conserving soil and water by establishing waterways, cultivating on the contour, terracing, contour stripcropping, or using minimum tillage.
10. Regulating grazing.

The rates of planting and fertilization needed to obtain yields equal to the estimates in columns B, table 4, are shown, by crop, in the following paragraphs.

Corn.—Soils that have an estimated yield of 85 bushels or more per acre require 100 to 125 pounds of nitrogen and 12,000 to 16,000 plants per acre. Soils that have an estimated yield of 60 to 85 bushels per acre generally require 75 to 100 pounds of nitrogen and 8,000 to 12,000 plants per acre. Soils that have an estimated yield of 40 to 60 bushels per acre generally require 50 to 70 pounds of nitrogen and about 8,000 plants. An estimated yield of less than 40 bushels per acre indicates that the soil should be used for some other crop.

Nitrogen can be supplied by commercial fertilizer, barnyard manure, residue from legumes, or any combination of these. The rates of fertilization and planting of corn grown for silage are the same as those of corn grown for grain. To determine the approximate yield of corn silage, in tons, divide the number of bushels of corn by 5.

Burley tobacco.—The requirement for yields listed in columns B of table 4 is 100 to 130 pounds of nitrogen at, or shortly before, planting time and 8,500 to 10,000 plants per acre.

Nitrogen can be supplied by commercial fertilizer or by a combination of commercial fertilizer and barnyard manure.

Wheat.—Apply 30 pounds of nitrogen per acre in fall at seeding time. Apply phosphate and potash in amounts indicated by soil tests.

Alfalfa.—Apply 20 pounds of borax per acre when alfalfa is seeded and 20 pounds annually thereafter. After the first year, apply annually the amounts of phosphate and potash indicated by soil tests. If the soils are not tested, apply 30 pounds of phosphate and at least 120 pounds of potash per acre.

Control grazing, control insects, and do not cut hay between September 10 and the date of the first killing frost. The yields listed for alfalfa in table 4 do not apply to soils that are ponded or flooded.

Lespedeza.—Seed Kobe lespedeza alone in spring on a prepared seedbed or allow it to volunteer. Add fertilizer in amounts determined by soil tests.

Annual yields of lespedeza overseeded on a small grain harvested for grain are about 50 to 60 percent less than yields of lespedeza seeded alone. Overseeding generally results in nearly complete failure of the lespedeza crop once every 2 years. If the small grain is harvested for hay, yields of lespedeza are generally about 80 percent of those obtained when lespedeza is seeded alone.

Pasture.—Apply fertilizer at seeding time in amounts determined by soil tests. If the clover in a mixture is sparse, topdress with 30 pounds of nitrogen per acre late in Februrary each year.

Pasture plants suited to the soils of Hawkins and Hancock Counties are too numerous to list in table 4. Yields of tall fescue and white clover, both of which are water tolerant, are estimated for the poorly drained soils. Yields of the common pasture plants are estimated for the rest of the soils. Common mixtures for improved pasture are orchardgrass and white clover or tall fescue and white clover. For information about the suitability of specified pasture plants for specified soils, see the sections "Descriptions of the Soils" and "Management by Capability Units."

Woodland [4]

Originally, all of the acreage of Hawkins and Hancock Counties was wooded. In 1971, trees covered 53 percent of Hawkins County and about 58 percent of Hancock County (*8*). Since 1961, there has been a 9,000-acre increase in forest land in Hawkins County and a 2,000-acre decrease in forest land in Hancock County. More than 80 percent of the woodland in the survey area is owned by farmers, 19 percent by miscellaneous private owners, and less than 1 percent by government or industry.

Good stands of commercial trees can be produced in these counties. Forests of pine and cedar occur most commonly in abandoned fields, and broadleaf trees generally predominate in areas that have never been cleared for farming. The composition of the forest cover of the survey area is 15 percent pine, 4 percent cedar, and 81 percent oak and hickory.

The forests of Hawkins County have had organized fire protection since 1949, but organized fire control was only begun in Hancock County in 1964.

The value of the wood products is substantial, although it is far below its potential.

There are markets for all types of forest products within 50 miles of these two counties. In addition to their commercial value, the forests provide wildlife habitat, recreation, natural beauty, and conservation of soil and water.

Woodland suitability groups

The soils of Hawkins and Hancock Counties have been assigned to 18 woodland suitability groups. Groupings are based on the potential of the soils for production of wood crops and on soil characteristics that affect management. The soils in each group have about the same suitability for trees, are about the same in productivity, and have limitations that require similar management.

Each woodland suitability group is identified by a three-part symbol, such as 2o7, 2w8, or 3c2. The first number in the group symbol indicates the relative potential productivity of the soils in the group for wood crops. It expresses the site quality, which is based on the site index of one or more important forest types or species. The numeral 1 indicates that potential productivity is very high, 2 indicates high, 3 indicates moderately high, 4 indicates moderate, and 5 indicates low. Only numerals 2, 3, 4, and 5 are used in this survey.

The second part of the symbol indicates an important soil property that imposes a hazard or limitation. The letter *x* indicates stoniness or rockiness; *w* indicates excessive wetness; *d* indicates restricted rooting depth because soils are shallow; *c* indicates that the main limitation is the amount of clayey material in the soil profile; *f* indicates that large amounts of coarse fragments in the soil profile adversely affect woodland management; *r* indicates that the slope is the main limitation; and *o* indicates no significant limitation.

The third part of the symbol indicates the degree of hazard or limitation and the general suitability of the soils for certain kinds of trees. The numeral 1 indicates that the soils have no significant limitation and are best suited to needleleaf trees (pine or redcedar); 2 indicates the soils have a moderate limitation and are best suited to needleleaf trees; 3 indicates the soils have a severe limitation and are best suited to needleleaf trees; 4 indicates the soils have no significant limitations and are best suited to broadleaf trees; 5 indicates the soils have moderate limitation and are best suited to broadleaf trees; 6 indicates the soils have a severe limitation and are best suited to broadleaf trees; 7 indicates no significant limitation and suitability for both needleleaf and broadleaf trees; 8 indicates a moderate limitation and suitability for both needleleaf and broadleaf trees; 9 indicates severe limitation and suitability for both needleleaf and broadleaf trees. The number 0 indicates that the soils are not suitable for the production of commercial wood crops. Only numerals 1, 2, 3, 7, 8, and 9 are used in this survey.

Table 5 shows the woodland suitability groups, site index of important trees, and preferred species. Each mapping unit shown on the soil map is assigned to a woodland suitability group, which is indicated in the "Guide to Mapping Units" at the back of this survey.

[4] By C. M. Hennenger, woodland conservationist, Soil Conservation Service.

TABLE 5.—*Woodland suitability grouping of the soils*

Woodland suitability groups	Potential soil productivity		Preferred species	
	Important trees	Site index	In existing stands	For planting
Group 2o7: Deep, well-drained, level to moderately steep soils; high available water capacity; high potential productivity; no serious limitations.	Yellow-poplar Upland oaks Loblolly pine White pine	96–105 76–85 86–95 86–95	Yellow-poplar, red oak, white oak, white pine, white ash, black cherry, black walnut, sugar maple.	Yellow-poplar, black walnut, loblolly pine, white pine.
Group 2r8: Deep, well-drained, steep soils; high available water capacity; high potential productivity; moderate erosion hazard and moderate equipment limitations because of steep slope.	Yellow-poplar Upland oaks Shortleaf pine White pine	96–105 76–85 86–95 86–95	Yellow-poplar, red oak, white oak, white pine, white ash, black cherry, black walnut, sugar maple.	Yellow-poplar, black walnut, white pine.
Group 2w8: Deep, moderately well-drained, level soils; high available water capacity; high potential productivity; moderate equipment limitations because of wetness.	Yellow-poplar Upland oaks Loblolly pine White pine	96–105 76–85 86–95 86–95	Yellow-poplar, red oak, white oak, white pine, loblolly pine, shortleaf pine, black walnut, white ash.	Yellow-poplar, loblolly pine, white pine.
Group 2w9: Level, poorly drained soils; high available water capacity; high potential productivity; severe equipment limitations and seedling mortality because of wetness.	Yellow-poplar Upland oaks Loblolly pine Bottom land oaks Sweetgum	96–105 76–85 86–95 86–95 86–95	Loblolly pine, sweetgum, red oak, white oak, sycamore, red maple.	Loblolly pine, sweetgum.
Group 3o7: Deep, well-drained and moderately well drained, gently sloping to moderately steep soils; medium to high available water capacity; moderately high productivity; no serious limitations.	Yellow-poplar Upland oaks Shortleaf pine Virginia pine Redcedar Loblolly pine White pine	86–95 66–75 66–75 66–75 46–55 76–85 76–85	Yellow-poplar, red oak, white oak, white pine, loblolly pine, shortleaf pine, Virginia pine, black walnut.	Yellow-poplar, black walnut, shortleaf pine, white pine, loblolly pine, Virginia pine.
Group 3r8: Mainly deep, well-drained, steep soils; medium to high available water capacity; moderately high potential productivity; moderate erosion hazard and equipment limitations because of slope.	Yellow-poplar Upland oaks Shortleaf pine Virginia pine Redcedar White pine Loblolly pine	86–95 66–75 66–75 66–75 46–55 76–85 76–85	Yellow-poplar, red oak, white oak, white pine, loblolly pine, shortleaf pine, Virginia pine, black walnut.	Yellow-poplar, black walnut, shortleaf pine, white pine, loblolly pine, Virginia pine.
Group 3f8: Deep and moderately deep, mostly well-drained, steep soils; low available water capacity; moderately high productivity; moderate erosion hazard, equipment limitations, and seedling mortality because of coarse fragments and slope.	Loblolly pine Upland oaks Shortleaf pine Virginia pine White pine	76–85 66–75 66–75 66–75 76–85	Yellow-poplar, shortleaf pine, Virginia pine, white pine, red oak, white oak.	Loblolly pine, shortleaf pine, Virginia pine, white pine.
Group 3c2: Moderately deep, well-drained, gently sloping to moderately steep soils; medium available water capacity; moderately high productivity; slight to moderate equipment limitations and seedling mortality because of high clay content.	Upland oaks Loblolly pine Shortleaf pine Virginia pine Redcedar	66–75 76–85 66–75 66–75 46–55	Shortleaf pine, Virginia pine, loblolly pine, redcedar, red oak.	Loblolly pine, Virginia pine, shortleaf pine, redcedar.
Group 3w8: Level, somewhat poorly drained soils that have a fragipan; medium available water capacity; moderately high productivity; moderate equipment limitations and seedling mortality because of wetness.	Sweetgum Upland oaks Loblolly pine Yellow-poplar	76–85 66–75 76–85 86–95	Yellow-poplar, sweetgum, white oak, red oak, loblolly pine, white pine, red maple.	Loblolly pine.
Group 3x8: Deep, well-drained, sloping to steep, cobbly soils; medium available water capacity; moderately high potential productivity; moderate equipment limitations because of small stones.	Yellow-poplar Shortleaf pine Upland oaks Virginia pine Redcedar	86–95 66–75 66–75 66–75 46–55	Yellow-poplar, shortleaf pine, Virginia pine, white pine, black walnut, red oak, white oak, sugar maple, black cherry.	Yellow-poplar, black walnut, loblolly pine, white pine.

TABLE 5.—*Woodland suitability grouping of the soils—Continued*

Woodland suitability groups	Potential soil productivity		Preferred species	
	Important trees	Site index	In existing stands	For planting
Group 3x9: Deep, well-drained, steep, cobbly soils; low or medium available water capacity; moderately high productivity; moderate to severe erosion hazard and equipment limitations because of slope and small stones.	Yellow-poplar White pine Upland oaks Shortleaf pine	86–95 76–85 66–75 66–75	Yellow-poplar, shortleaf pine, Virginia pine, white pine, black walnut, red oak, white oak, sugar maple, black cherry.	Too stony to plant. Manage by natural regeneration.
Group 4o1: Moderately deep, well-drained, sloping soils; medium available water capacity; moderate potential productivity; no serious limitations.	Shortleaf pine Virginia pine Loblolly pine White pine	56–65 66–75 66–75 66–75	Shortleaf pine, Virginia pine, loblolly pine, white pine.	Loblolly pine, shortleaf pine, Virginia pine, white pine.
Group 4f3: Deep and moderately deep, mainly well drained, sloping to very steep soils; medium to low available water capacity; moderate productivity; moderate to severe erosion hazard, equipment limitations and seedling mortality because of coarse fragments and strong slope.	Upland oaks Shortleaf pine Virginia pine White pine Loblolly pine	56–65 56–65 56–65 66–75 66–75	Virginia pine, redcedar, red oak, shortleaf pine, white oak.	Shortleaf pine, Virginia pine, white pine, loblolly pine.
Group 4c2: Moderately deep, moderately well-drained, sloping soils; low available water capacity; moderate potential productivity; moderate equipment limitations and seedling mortality because of high clay content.	Shortleaf pine Loblolly pine Redcedar Virginia pine	56–65 60–70 40–50 56–65	Loblolly pine, shortleaf pine, Virginia pine, redcedar.	Redcedar, loblolly pine, Virginia pine.
Group 4c3e: Moderately deep and deep, well-drained, steep and moderately steep soils; medium to low available water capacity; moderate productivity; moderate to severe erosion hazard, equipment limitations, and seedling mortality because of high clay content.	Loblolly pine Virginia pine White pine Redcedar	66–75 56–65 66–75 35–45	Virginia pine, loblolly pine, redcedar, white pine.	Loblolly pine, redcedar, white pine, Virginia pine.
Group 4d3: Shallow, excessively drained, sloping to very steep soils; mostly low available water capacity; moderate productivity; moderate to severe erosion hazard, equipment limitations, and seedling mortality because of shale fragments, depth, and slope.	Upland oaks Virginia pine Redcedar White pine	56–65 56–65 35–45 66–75	Shortleaf pine, Virginia pine, redcedar, loblolly pine, white pine.	Virginia pine, redcedar, white pine.
Group 4x3: Moderately deep and shallow, well drained to excessively drained, steep to moderately steep soils; low available water capacity; moderate productivity; moderate to severe erosion hazard, equipment limitations, and seedling mortality because of rock outcrops and strong slope.	Virginia pine White pine Redcedar Upland oaks Shortleaf pine Loblolly pine	56–65 66–75 35–45 56–65 56–65 66–75	Virginia pine, shortleaf pine, red oak, white pine, loblolly pine.	Virginia pine, redcedar, white pine, shortleaf pine, loblolly pine.
Group 5x3: Rock outcrops and moderately deep soils; dominantly steep; low productivity; severe limitations because of rocks and steep slopes.	Loblolly pine Virginia pine Shortleaf pine Redcedar	55–65 45–55 45–55 25–35	Redcedar, Virginia pine, loblolly pine.	Loblolly pine, Virginia pine, redcedar.

Included in table 5 under each woodland suitability group symbol is a brief description of the soils, their potential productivity, and the kind and degree of management hazards or limitations, which are defined below.

Erosion hazard refers to the potential hazard of soil losses in common woodland management operations. The hazard is *slight* if expected soil losses are small; *moderate* if some soil losses are expected and care is needed during logging and construction to reduce soil losses; and *severe* if special methods of operation are necessary for preventing excessive soil losses.

Equipment limitations depend on soil characteristics that restrict or prohibit the use of harvesting equipment, either seasonally or continually. The limitation is *slight* if there are no restrictions on the kind of equipment that can be used or on the time of year that the equipment can be used; *moderate* if use of equipment is restricted for 3 months of the year or less; *severe* if special equipment is needed and its use is severely restricted for more than 3 months of the year.

Seedling mortality refers to the expected loss of naturally occurring or planted tree seedlings, as influenced by kinds of soil or topographic conditions when plant competition is assumed not to be a factor. The rating is *slight* if expected loss is 0 to 25 percent; moderate if expected loss is 25 to 50 percent; and severe if a loss of more

than 50 percent of the seedlings is expected. It is assumed that seed supplies are adequate.

Site index is the average height, in feet, that the dominant and codominant trees of a given species, growing on the specified soils, will reach in 50 years. The site index ranges given in this survey are based on measurements of trees of different species.

Preferred species refers to the kinds of trees to be favored in management of existing stands and the kinds to be chosen for planting. The trees listed are not in order of priority.

Wildlife [5]

Table 6 shows the suitability of the soils in Hawkins and Hancock Counties for elements of wildlife habitat and habitat for three kinds of wildlife. Ratings refer only to the suitability of the soil. Not considered are the climate, present land use, or the distribution of wildlife and people. The suitability of individual sites must be determined by onsite inspection.

The ratings in table 6 are explained in the following paragraphs.

Good: Habitat generally is easily created, improved, or maintained; the soil has few or no limitations that affect management; and satisfactory results can be expected.

Fair: Habitat can be created, improved, or maintained in most places; the soil has moderate limitations that affect management; and moderately intensive management is generally needed for satisfactory results.

Poor: Habitat can be created, improved, or maintained in most places; limitations are severe; habitat management is difficult and expensive; and results are not always satisfactory.

Very Poor: Habitat is impractical or impossible to create, improve, or maintain, and unsatisfactory results are probable.

The habitat elements shown in table 6 are defined in the following paragraphs.

Grain and seed crops are grain-producing or seed-producing annuals, such as corn, sorghum, millet, and soybeans.

Grasses and legumes are domestic grasses and legumes that are established by planting and furnish food and cover for wildlife. They include tall fescue, orchardgrass, ryegrass, panicgrasses, clover, annual lespedeza, and bush lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses, forbs, and weeds that provide food and cover for upland wildlife. Examples are beggarweed, perennial lespedeza, wild beans, pokeberry, partridge peas, crotons, and cheatgrass.

Hardwood woody plants are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, or foliage (browse). These plants, which are used extensively as food by wildlife, are commonly established naturally or may be planted. They include oak, beech, cherry, dogwood, viburnum, maple, grape, honeysuckle, greenbrier, and autumn-olive.

Coniferous woody plants are cone-bearing trees and shrubs that are used mainly as cover but that also furnish food in the form of browse, seeds, or fruitlike cones. They become established naturally or may be planted. Examples are pine, hemlock, cedar, and ornamental plants.

Wetland food and cover plants are annual and perennial wild herbaceous plants on moist to wet sites. These plants do not include submerged or floating aquatic plants. They furnish the food or cover used mostly by wetland wildlife. Examples are smartweed, wild millet, spikerush and other rushes, sedges, burreed, tearthumb, and aneilema.

Shallow-water areas are low dikes or other water-control structures established to create habitat mainly for waterfowl. They may be designed so that they can be drained, planted, and flooded, or they may be used as permanent impoundments for submerged aquatics.

The three types of wildlife listed in table 6 are defined in the following paragraphs.

Open-land wildlife includes cottontail rabbit, quail, dove, fox, meadowlark, field sparrow, and other birds and mammals that normally live on cropland, pastures, meadows, lawns, and in other open-land areas where grasses, herbs, and shrubby plants grow.

Woodland wildlife includes squirrel, woodcock, thrush, vireo, deer, grouse, raccoon, wild turkey, and other birds and mammals that normally live in wooded areas.

Wetland wildlife includes mink, muskrat, duck, geese, rail, heron, shore birds, and other birds and mammals that normally live in marshes, swamps, and other wet areas.

Engineering Uses of the Soils [6]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting perform-

[5] FLOYD R. FESSLER, biologist, Soil Conservation Service, helped to prepare this section.

[6] JOE D. CARMACK, soil hydraulics engineer, Soil Conservation Service, helped to prepare this section.

TABLE 6.—*Suitability of soils for elements of*

Soil	Suitability for habitat elements—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Allen:				
AnC	Fair	Good	Good	Good
AnD	Fair	Fair	Good	Good
AnE	Poor	Fair	Good	Good
Altavista: At	Good	Good	Good	Good
Bland: BdE	Very poor	Poor	Fair	Poor
Bouldin: BoF	Very poor	Very poor	Good	Good
Calvin:				
CaE	Poor	Poor	Fair	Fair
CaF, CcF	Very poor	Very poor	Fair	Fair
Claiborne:				
CeC, CeD	Fair	Good	Good	Good
CeE, CfE3	Very poor	Fair	Good	Good
Clarksville:				
CkD	Poor	Fair	Fair	Fair
CkE	Very poor	Poor	Fair	Fair
Cloudland: CoB, CoC	Fair	Good	Good	Fair
Cynthiana: CyD, CyE	Very poor	Poor	Fair	Poor
Dandridge:				
DaD	Poor	Fair	Fair	Poor
DaE	Very poor	Fair	Fair	Poor
DaF	Very poor	Very poor	Fair	Poor
Decatur: DcC, DcD	Fair	Good	Good	Good
Dewey: DeC, DeD	Fair	Good	Good	Good
Dunmore:				
DnC	Fair	Good	Good	Good
DnD	Poor	Good	Good	Good
DnE, DoD	Very poor	Fair	Good	Good
Dunning: Du	Fair	Fair	Fair	Fair
Ealy: Ea	Good	Good	Good	Good
Emory: Em	Good	Good	Good	Good
Etowah:				
EtB	Good	Good	Good	Good
EtC, EtD	Fair	Good	Good	Good
Fullerton:				
FnC	Fair	Good	Good	Good
FnD	Poor	Fair	Good	Good
FnE	Very poor	Fair	Good	Good
Gilpin: GpF	Very poor	Poor	Fair	Fair
Greendale: Gr	Good	Good	Good	Good
Guthrie: Gu	Poor	Fair	Fair	Fair
Hamblen: Ha	Good	Good	Good	Good
Hartsells:				
HeC	Fair	Good	Good	Good
HeD	Poor	Good	Good	Good
Hayter:				
HhC	Good	Good	Good	Good
HhD	Fair	Good	Good	Good
HhE	Poor	Fair	Good	Good
HkD	Poor	Good	Good	Good
HkE, HkF	Very poor	Fair	Good	Good
Holston:				
HoB	Good	Good	Good	Good
HoC	Fair	Good	Good	Good
HoD	Poor	Fair	Good	Good
Holston-Urban land complex: Hx. Too variable to rate.				
Jefferson:				
JeC	Fair	Good	Good	Good
JeD	Fair	Fair	Good	Good
JfC, JfD	Poor	Fair	Good	Good
JfE	Very poor	Fair	Good	Good
Leadvale: LaB, LaC	Fair	Good	Good	Fair
Leesburg: LbD	Poor	Fair	Good	Good
Lehew: LeF	Very poor	Very poor	Fair	Poor
Lindside: Ln	Good	Good	Fair	Good
Litz:				
LzD	Poor	Fair	Fair	Fair
LzE, LzE3, LzF	Very poor	Poor	Fair	Fair
Melvin: Ma	Poor	Poor	Fair	Fair

wildlife habitat and kinds of wildlife

Suitability for habitat elements—Continued			Potential as habitat for—		
Coniferous woody plants	Wetland food and cover plants	Shallow-water development	Open-land wildlife	Woodland wildlife	Wetland wildlife
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Very poor	Very poor	Poor	Fair	Very poor.
Fair	Very poor	Very poor	Poor	Fair	Very poor.
Fair	Very poor	Very poor	Poor	Fair	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Fair	Very poor	Very poor	Fair	Fair	Very poor.
Fair	Very poor	Very poor	Poor	Fair	Very poor.
Fair	Poor	Poor	Good	Good	Poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Poor	Very poor	Very poor	Fair	Poor	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Fair	Good	Good	Fair	Fair	Good.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Fair	Very poor	Very poor	Poor	Fair	Very poor.
Good	Poor	Poor	Good	Fair	Good.
Fair	Good	Good	Fair	Good	Poor.
Good	Poor	Poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Fair	Poor	Very poor	Good	Fair	Poor.
Good	Very poor	Very poor	Fair	Fair	Very poor.
Poor	Very poor	Very poor	Very poor	Poor	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Fair	Very poor	Very poor	Poor	Fair	Very poor.
Fair	Very poor	Very poor	Poor	Fair	Very poor.
Fair	Good	Fair	Fair	Fair	Fair.

TABLE 6.—*Suitability of soils for elements of*

Soil	Suitability for habitat elements—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Minvale:				
MeB	Good	Good	Good	Good
MeC, MeD	Fair	Good	Good	Good
Montevallo: MnD, MnE, MoE	Very poor	Poor	Poor	Poor
Needmore: NdB, NdC	Fair	Good	Good	Good
Nella:				
NeC	Fair	Fair	Good	Good
NeD	Poor	Fair	Good	Good
NeE	Very poor	Poor	Good	Good
Rock outcrop-Talbott complex: RtE	Very poor	Very poor	Poor	Poor
Sensabaugh: Sa	Good	Good	Good	Good
Sequatchie: Se	Good	Good	Good	Good
Sequoia:				
SkC2	Fair	Good	Good	Good
SkD2	Poor	Good	Good	Good
Sewanee: Sn	Good	Good	Good	Good
Shouns:				
SoC	Good	Good	Good	Good
SoD	Fair	Good	Good	Good
Staser: Ss	Good	Good	Good	Good
Statler: St	Good	Good	Good	Good
Sullivan: Su	Good	Good	Good	Good
Taft: Ta	Fair	Fair	Good	Fair
Talbott:				
TbC2	Fair	Good	Good	Fair
TbD2	Poor	Fair	Good	Fair
ToD3	Poor	Fair	Fair	Fair
TrD, TrE	Very poor	Poor	Fair	Fair
Wallen: WaF, WeF	Very poor	Very poor	Fair	Fair
Whitesburg: Ws	Good	Good	Good	Good
Whitwell: Wt	Good	Good	Good	Good

ance of structures on the same or similar kinds of soil in other locations.

6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 7 and 8, which show, respectively, several estimated soil properties significant to engineering and interpretations for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in table 7 and 8, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists that is not known to all engineers. The Glossary defines many of these terms commonly used in soil science.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*2*), used by the SCS engineers, Department of Defense, and others, and the AASHTO (*1*) system, adopted by the American Association of State Highway and Transportation Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML-CL.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A 1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade.

Estimated engineering properties of soils

Several estimated soil properties significant in engineer-

wildlife habitat and kinds of wildlife—Continued

Suitability for habitat elements—Continued			Potential as habitat for—		
Coniferous woody plants	Wetland food and cover plants	Shallow-water development	Open-land wildlife	Woodland wildlife	Wetland wildlife
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Poor	Good	Very poor.
Poor	Very poor	Very poor	Very poor	Poor	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Poor	Good	Good	Poor.
Fair	Fair	Fair	Fair	Fair	Fair.
Fair	Very poor	Very poor	Good	Fair	Very poor.
Fair	Very poor	Very poor	Fair	Fair	Very poor.
Fair	Very poor	Very poor	Fair	Fair	Very poor.
Fair	Very poor	Very poor	Poor	Fair	Very poor.
Fair	Very poor	Very poor	Very poor	Fair	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Poor	Good	Good	Poor.

ing are given in table 7. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other countries. Following are explanations of some of the columns in table 7.

Depth to seasonal water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Soil texture is described in table 7 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 7, but in table 8 the data on liquid limit and plasticity index are based on tests of soil samples.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 7 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay

TABLE 7.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such to other series that appear in the first column of

Soil series and map symbols	Depth to seasonal water table	Depth to bedrock	Depth from surface	Dominant USDA texture	Classification	
					Unified	AASHTO
	Feet	*Feet*	*Inches*			
Allen: AnC, AnD, AnE	>6	>6	0–15	Loam	ML, CL, CL–ML	A–4
			15–50	Clay loam	CL, CL–ML	A–4, A–6
			50–70	Clay, clay loam	CL	A–6, A–7
Altavista: At	2–3	>6	0–9	Silt loam	ML, CL, CL–ML	A–4
			9–42	Silt loam, clay loam	CL	A–4, A–6
			42–60	Loam	CL, CL–ML	A–4, A–6
*Bland: BdE Rock outcrop part not estimated.	>3	1½–3	0–5	Silty clay loam	CL, CH	A–6, A–7
			5–21	Silty clay, clay	CH	A–7
			21–25	Shaly silty clay	CH	A–7
			25	Limestone.		
Bouldin: BoF	>6	>6	0–8	Cobbly loam	CL–ML, ML, GM–GC, SM, GM	A–2, A–4
			8–65	Cobbly loam, cobbly clay loam	GC, CL, SC	A–4, A–2, A–6
*Calvin: CaE, CaF, CcF For Wallen part of CcF, see Wallen series.	>3½	1½–3	0–5	Silt loam	CL–ML, ML, CL	A–4
			5–15	Shaly silt loam	CL–ML, CL, GM, GC	A–4
			15–25	Shaly silt loam	GM, GC, GM–GC, SM, SC	A–2, A–4, A–1
			25	Shale.		
Claiborne: CeC, CeD, CeE, CfE3	>6	>6	0–17	Silt loam	CL–ML, ML, CL	A–4
			17–46	Silty clay loam	CL	A–4, A–6
			46–85	Clay	MH	A–7
Clarksville: CkD, CkE	>6	>6	0–12	Cherty silt loam	CL–ML, GM–GC, ML, GM	A–2, A–4
			12–22	Cherty silty clay loam	GM, GC	A–1, A–2
			22–63	Cherty silty clay loam	GM, GC	A–2
Cloudland: CoB, CoC	2–2½	>5	0–26	Loam	CL–ML, ML, CL	A–4
			26–50	Loam	CL–ML, ML, CL, SM, SC	A–4
			50–65	Gravelly clay loam	CL	A–6
Cynthiana: CyD, CyE	>2	1–2	0–17	Flaggy silty clay loam, flaggy silty clay.	CH, CL	A–6, A–7
				Limestone and shale.		
Dandridge: DaD, DaE, DaF	>6	½–2	0–6	Shaly silty clay loam	CL, GC	A–6, A–7
			6–16	Shaly silty clay	GC	A–7
			16	Shale.		
Decatur: DcC, DcD	>6	>6	0–8	Silt, loam, silty clay loam	CL, ML	A–4, A–6
			8–15	Silty clay loam	ML, CL	A–7, A–6
			15–72	Clay	MH, ML, CL	A–7
Dewey: DeC, DeD	>6	>6	0–8	Silt loam	CL–ML, ML, CL	A–4, A–6
			8–72	Clay	MH, CL	A–7
Dunmore: DnC, DnD, DnE, DoD	>6	>6	0–7	Silt loam, silty clay loam	CL–ML, CL	A–4, A–6
			7–11	Silty clay loam	CL	A–6
			11–65	Clay	MH	A–7

significant to engineering

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring this table. The symbol > means greater than]

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential
	No. 4	No. 10	No. 40	No. 200						
Percent					*Percent*		*Inches per hour*	*Inches per inch of soil*	*pH*	
0–2	90–100	80–100	75–90	50–75	20–30	4–9	0.6–2.0	0.15–0.19	4.5–5.5	Low.
0–5	85–100	80–100	75–90	55–80	25–38	7–18	0.6–2.0	0.12–0.17	4.5–5.5	Low.
0–10	85–100	80–100	70–95	55–80	25–42	11–23	0.6–2.0	0.12–0.18	4.5–5.5	Low.
0–2	95–100	90–100	80–90	60–85	20–30	4–9	0.6–2.0	0.18–0.20	5.1–6.0	Low.
0–2	95–100	90–100	80–90	65–85	25–35	10–15	0.6–2.0	0.15–0.18	5.1–6.0	Low.
0–3	85–100	80–100	65–90	55–75	20–30	5–11	0.6–2.0	0.10–0.18	5.1–6.0	Low.
0–5	95–100	90–100	85–95	80–95	38–50	18–25	0.2–0.6	0.16–0.18	5.6–7.3	Moderate.
0–5	90–100	85–100	80–90	75–90	52–62	28–36	0.2–0.6	0.12–0.15	5.6–7.3	Moderate.
0–10	75–95	65–95	60–90	55–90	52–62	28–36	0.2–0.6	0.08–0.11	5.6–7.3	Moderate.
20–35	65–80	55–70	40–65	30–55	20–25	3–7	2.0–6.0	0.07–0.11	4.5–5.5	Low.
20–35	60–75	50–65	35–60	25–50	25–38	8–16	2.0–6.0	0.07–0.11	4.5–5.5	Low.
0–10	75–90	70–85	60–80	50–70	20–30	3–9	0.6–2.0	0.14–0.18	5.1–6.0	Low.
5–15	60–85	50–80	45–75	40–65	20–30	4–9	0.6–2.0	0.10–0.16	5.1–5.5	Low.
15–35	35–65	30–55	25–50	20–40	20–30	3–9	0.6–2.0	0.06–0.10	5.1–5.5	Low.
0–3	85–100	80–95	70–95	60–85	24–35	4–9	0.6–2.0	0.17–0.20	5.1–6.0	Low.
0–3	85–100	80–95	70–90	60–85	28–40	8–20	0.6–2.0	0.17–0.20	4.5–5.5	Low.
0–5	80–100	75–95	65–90	60–85	50–78	20–42	0.6–2.0	0.14–0.17	4.5–5.5	Moderate.
2–20	50–75	40–65	35–60	30–55	15–25	2–7	2.0–6.0	0.07–0.12	4.5–5.5	Low.
5–25	20–60	15–50	10–40	10–35	20–30	3–10	2.0–6.0	0.05–0.10	4.5–5.5	Low.
10–30	20–55	15–50	10–40	10–35	30–40	10–18	2.0–6.0	0.05–0.10	4.5–5.5	Low.
0	100	95–100	90–100	60–75	20–30	3–9	0.6–2.0	0.16–0.18	4.5–5.5	Low.
0	95–100	90–100	70–80	40–70	20–30	3–10	0.06–0.2	0.10–0.14	4.5–5.5	Low.
0–5	90–100	80–95	60–85	50–75	25–40	11–20	0.2–0.6	0.10–0.14	4.5–5.5	Low.
10–30	70–90	65–85	60–80	50–75	40–60	16–35	0.2–0.6	0.10–0.14	6.1–7.8	Moderate.
0–5	45–80	40–80	35–75	35–70	34–48	14–25	0.6–2.0	0.08–0.12	6.1–7.8	Low.
0–10	25–50	20–50	15–45	15–40	42–60	20–30	0.2–0.6	0.06–0.10	6.1–7.8	Low.
0	100	90–95	80–85	65–70	25–32	7–12	0.6–2.0	0.17–0.18	4.5–5.5	Low.
0	100	95–100	85–90	75–80	34–43	12–18	0.6–2.0	0.16–0.18	4.5–5.5	Moderate.
0	100	95–100	85–90	75–80	45–65	20–30	0.6–2.0	0.14–0.16	4.5–5.5	Moderate.
0	90–100	80–100	75–90	65–75	24–32	6–9	0.6–2.0	0.18–0.20	5.1–5.5	Low.
0	90–100	80–100	75–90	70–85	45–65	20–30	0.6–2.0	0.13–0.15	5.1–5.5	Moderate.
0–2	85–100	80–90	70–80	65–75	25–38	5–15	0.6–2.0	0.17–0.20	4.5–5.5	Low.
0–2	90–100	80–95	75–95	70–90	30–38	12–16	0.6–2.0	0.15–0.18	4.5–5.5	Low.
0–2	90–100	80–95	75–95	75–90	55–70	24–36	0.6–2.0	0.13–0.16	4.5–5.5	Moderate.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal water table	Depth to bedrock	Depth from surface	Dominant USDA texture	Classification	
					Unified	AASHTO
	Feet	*Feet*	*Inches*			
Dunning: Du	0–1	4–6	0–60	Silty clay loam, silty clay	CH	A–7
			60	Shale.		
Ealy: Ea	3–5	5–6	0–68	Loam, fine sandy loam	SM–SC, SM, ML, CL–ML	A–4, A–2
Emory: Em	>6	>6	0–53	Silt loam, silty clay loam, loam	CL, CL–ML	A–4, A–6
Etowah: EtB, EtC, EtD	>6	>6	0–9	Silt loam	CL–ML, ML, CL	A–4
			9–50	Silty clay loam	CL	A–4, A–6
			50–72	Clay	MH, CL, ML	A–7
Fullerton: FnC, FnD, FnE	>6	>6	0–13	Cherty silt loam	CL–ML, ML, CL	A–4
			13–23	Cherty silty clay loam	CL	A–6
			23–72	Cherty clay	MH, CL	A–7
Gilpin: GpF	>6	1½–3	0–12	Silt loam	CL–ML, ML, CL	A–4
			12–30	Silty clay loam, shaly silty clay	CL, GC, SC	A–6, A–4
			30	Siltstone.		
Greendale: Gr	5–6	>6	0–56	Silt loam	ML, CL, CL–ML	A–4, A–6
Guthrie: Gu	0–1	>6	0–25	Silt loam	CL–ML, ML, CL	A–4
			25–65	Silt loam	CL	A–6
Hamblen: Ha	1½–2½	3½–6	0–52	Silt loam, loam	CL, CL–ML	A–4, A–6
			52	Shale.		
Hartsells: HeC, HeD	>4	2–3½	0–13	Loam, fine sandy loam	ML, SM, ML–CL, SM, SM–SC	A–4
			13–32	Sandy clay loam	SC, CL	A–6, A–4
			32–38	Channery sandy clay loam	SM, ML	A–4
			38	Sandstone.		
Hayter: HhC, HhD, HhE	>6	>6	0–12	Loam	CL–ML, ML, CL	A–4
			12–67	Clay loam, loam	CL	A–6
Hayter cobbly: HkD, HkE, HkF	>6	>6	0–8	Cobbly loam	CL–ML, ML, CL	A–4
			8–60	Cobbly clay loam, loam	CL	A–6
Holston: HoB, HoC, HoD, Hx Urban land part of Hx is too variable for valid estimates to be made.	>6	>6	0–11	Loam	CL–ML, ML	A–4
			11–32	Clay loam	CL, CL–ML	A–4, A–6
			32–60	Clay loam	CL, ML	A–4, A–6, A–7
			60–75	Loam	CL, ML, GM, GC, SM, SC	A–4, A–6, A–7
Jefferson:						
JeC, JeD	>6	>5	0–9	Loam	CL–ML, CL	A–4
			9–50	Clay loam	CL	A–6
			50–70	Loam	CL–ML, CL, SC, SM–SC	A–4, A–6
			70	Shale.		
JfC, JfD, JfE	>6	>5	0–10	Cobbly loam	CL–ML, ML, CL	A–4
			10–60	Cobbly clay loam	CL, SC	A–4, A–6

significant to engineering—Continued

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential
	No. 4	No. 10	No. 40	No. 200						
Percent					*Percent*		*Inches per hour*	*Inches per inch of soil*	*pH*	
0	95–100	85–100	85–95	75–85	50–62	25–35	0.06–0.2	0.13–0.16	5.6–7.3	High.
0–3	95–100	80–100	75–95	30–60	15–25	[1]NP–7	2.0–6.0	0.15–0.18	5.1–5.5	Low.
0–2	95–100	90–100	85–100	80–95	23–39	7–16	0.6–2.0	0.18–0.20	5.1–6.0	Low.
0	100	95–100	70–90	55–75	20–30	4–9	0.6–2.0	0.18–0.20	5.1–5.5	Low.
0	100	95–100	90–95	75–85	25–35	9–16	0.6–2.0	0.16–0.18	5.1–5.5	Low.
0	100	95–100	90–95	70–90	40–60	15–22	0.6–2.0	0.16–0.17	5.1–5.5	Low.
0–5	70–90	50–75	50–70	50–65	20–30	4–9	0.6–2.0	0.10–0.16	4.5–5.5	Low.
0–5	60–90	50–75	50–70	50–65	30–38	11–16	0.6–2.0	0.10–0.15	4.5–5.5	Low.
0–5	60–90	50–75	50–70	50–70	45–75	22–38	0.6–2.0	0.10–0.14	4.5–5.5	Low.
0–3	70–90	65–85	60–80	50–70	18–25	4–9	0.6–2.0	0.14–0.16	4.5–5.5	Low.
0–10	65–90	60–85	55–80	45–65	25–38	8–15	0.6–2.0	0.09–0.12	4.5–5.5	Low.
0	85–100	80–95	70–90	65–85	20–35	4–12	0.6–2.0	0.17–0.20	5.1–6.0	Low.
0	100	95–100	95–100	90–100	20–25	3–8	0.6–2.0	0.20–0.22	4.5–5.5	Low.
0	100	95–100	95–100	90–100	20–30	11–20	0.06–0.2	0.13–0.15	4.5–5.5	Low.
0–2	90–100	80–100	65–95	55–85	22–38	5–14	0.6–2.0	0.18–0.20	5.6–7.3	Low.
0	95–100	90–100	80–90	40–60	12–20	2–6	2.0–6.0	0.13–0.15	4.5–5.5	Low.
0	85–95	80–95	70–90	40–55	25–35	10–15	0.6–2.0	0.15–0.18	4.5–5.5	Low.
0–5	70–90	60–80	60–70	35–50	25–30	3–6	2.0–6.0	0.10–0.14	4.5–5.5	Low.
0–3	90–100	75–95	70–90	55–75	20–30	3–9	0.6–2.0	0.18–0.20	5.1–6.0	Low.
0–3	90–100	85–95	80–90	75–85	25–38	10–18	0.6–2.0	0.16–0.18	5.1–6.0	Low.
10–20	80–90	75–85	70–80	60–70	20–30	3–9	0.6–2.0	0.13–0.17	5.1–6.0	Low.
10–25	80–90	75–85	65–80	55–70	25–38	11–18	0.6–2.0	0.12–0.16	5.1–6.0	Low.
0–3	90–100	80–100	80–100	50–75	NP–25	NP–7	0.6–2.0	0.16–0.22	4.5–5.5	Low.
0–3	90–100	80–100	80–100	60–80	20–30	5–12	0.6–2.0	0.15–0.20	4.5–5.5	Low.
0–5	90–100	80–100	80–100	60–90	30–48	5–22	0.6–2.0	0.12–0.20	4.5–5.5	Low.
0–15	65–100	55–100	50–95	40–90	35–48	6–22	0.6–2.0	0.10–0.18	4.5–5.5	Low.
0–10	85–95	75–85	65–75	50–65	15–25	3–8	2.0–6.0	0.15–0.18	4.5–5.5	Low.
0–10	80–95	70–85	60–75	50–65	25–38	10–20	2.0–6.0	0.12–0.17	4.5–5.5	Low.
10–20	70–95	60–70	50–60	40–50	25–33	5–12	2:0–6.0	0.09–0.14	4.5–5.5	Low.
5–10	80–90	65–80	60–70	50–60	15–25	3–8	2.0–6.0	0.12–0.16	4.5–5.5	Low.
10–15	75–90	60–80	55–70	45–60	25–38	9–20	2.0–6.0	0.10–0.15	4.5–5.5	Low.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal water table	Depth to bedrock	Depth from surface	Dominant USDA texture	Classification	
					Unified	AASHTO
	Feet	*Feet*	*Inches*			
Leadvale: LaB, LaC	2–3	>4	0–8	Silt loam	ML–CL, ML, CL	A–4
			8–24	Silt loam, silty clay loam	CL–ML, CL	A–4, A–6
			24–48	Silt loam	CL	A–6
			48–63	Silty clay loam	MH, CL	A–7
			63	Shale.		
Leesburg: LbD	>6	>6	0–13	Gravelly loam	ML, GM, CL–ML, GM–GC	A–4
			13–63	Gravelly clay loam	CL, GC, SC	A–4, A–6
			63–68	Silty clay	CL, MH	A–7
Lehew: LeF	>3	1½–3	0–28	Channery loam	ML, CL–ML, GM–GC, GM, GC	A–2, A–4
			28	Siltstone and sandstone.		
Lindside: Ln	1½–2½	>6	0–55	Silty loam	ML, CL, CL–ML	A–4, A–6
Litz: LzD, LzE, LzE3, LzF	>3	1½–3	0–5	Shaly silt loam	CL–ML, ML, CL	A–4
			5–25	Shaly silty clay loam	CL, GC	A–6
			25	Shale.		
Melvin: Ma	0–1	>6	0–60	Silt loam, silty clay loam, and stratified clay loam and fine sand.	CL, CL–ML	A–4, A–6
Minvale: MeB, MeC, MeD	>6	>6	0–15	Silt loam, channery silt loam	ML–CL, CL, ML	A–4
			15–62	Channery silty clay loam, silty clay loam.	CL	A–4, A–6
*Montevallo: MnD, MnE, MoE. For properties of Talbott part of MoE, see Talbott series.	>2	½–1½	0–5	Shaly silt loam	CL–ML, ML, CL	A–4
			5–14	Shaly silt loam	GC, GM–GC	A–2
			14–25	Fractured shale.		
			25	Shale.		
Needmore: NdB, NdC	>3½	1½–3½	0–7	Silt loam	CL–ML, ML, CL	A–4
			7–34	Silty clay	MH, CL	A–7
			34–40	Shaly silty clay	GC, MH, CL	A–7
			40	Shale.		
Nella: NeC, NeD, NeE	>6	>6	0–9	Cobbly loam	CL–ML, ML, SM, SM–SC	A–4
			9–70	Cobbly clay loam, clay	CL, SC	A–6
*Rock outcrop-Talbott complex: RtE. Properties of Rock outcrop part not estimated. For Talbott part, see Talbott series.						
Sensabaugh: Sa	>6	>5	0–62	Gravelly loam, gravelly clay loam	CL–ML, SM–SC, ML, CL, SM, SC	A–4, A–6
Sequatchie: Se	>6	>6	0–9	Loam	CL–ML, CL, ML	A–4
			9–60	Loam	CL, CL–ML	A–4, A–6
Sequoia: SkC2, SkD2	>4	1½–3½	0–7	Silt loam	CL–ML, CL	A–4, A–6
			7–38	Silty clay	MH, CL	A–7
			38	Shale.		

significant to engineering—Continued

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential
	No. 4	No. 10	No. 40	No. 200						
Percent					*Percent*		*Inches per hour*	*Inches per inch of soil*	*pH*	
0	95–100	95–100	80–95	75–95	20–30	4–9	0.6–2.0	0.18–0.22	4.5–5.5	Low.
0	95–100	95–100	90–100	80–95	20–35	5–12	0.6–2.0	0.18–0.20	4.5–5.5	Low.
0	90–100	80–100	75–100	70–95	25–35	11–20	0.06–0.2	0.14–0.16	4.5–5.5	Low.
0–5	85–100	70–100	65–95	60–90	45–75	20–30	0.2–0.6	0.13–0.17	4.5–5.5	Low.
5–10	70–85	65–80	50–75	40–65	15–25	3–7	0.6–2.0	0.12–0.16	4.5–5.5	Low.
10–15	65–80	60–80	50–75	40–70	25–38	9–20	0.6–2.0	0.12–0.16	4.5–5.5	Low.
0–10	90–100	85–90	80–90	60–80	43–75	20–40	0.2–0.6	0.05–0.12	4.5–5.5	Moderate.
10–20	60–80	50–65	40–55	30–55	15–25	3–9	2.0–6.0	0.08–0.14	4.5–5.5	Low.
0	100	95–100	90–100	85–95	22–38	4–14	0.6–2.0	0.18–0.22	6.1–7.3	Low.
0–10	75–90	70–85	65–75	55–65	20–30	4–9	0.6–2.0	0.14–0.17	4.5–5.5	Low.
15–30	60–70	50–60	45–55	35–50	28–38	11–18	0.6–2.0	0.07–0.12	4.5–5.5	Low.
0	100	95–100	90–95	85–95	22–38	5–15	0.6–2.0	0.17–0.20	5.6–7.3	Low.
0–5	75–90	70–85	60–75	55–70	20–30	3–9	0.6–2.0	0.16–0.18	4.5–5.5	Low.
0–5	75–90	70–85	60–75	55–70	20–30	8–15	0.6–2.0	0.15–0.18	4.5–5.5	Low.
0–5	60–90	60–85	55–75	50–65	25–30	3–9	0.6–2.0	0.09–0.12	4.5–5.5	Low.
0–5	55–70	50–65	35–50	30–35	20–35	5–15	0.6–2.0	0.06–0.10	4.5–5.5	Low.
0	95–100	95–100	90–100	85–95	23–33	5–9	0.6–2.0	0.18–0.20	4.5–6.0	Low.
0–3	95–100	95–100	95–100	90–100	43–75	20–38	0.2–0.6	0.15–0.17	4.5–6.0	Moderate.
0–15	55–100	50–100	45–100	40–85	43–75	20–38	0.2–0.6	0.05–0.12	5.5–6.5	Moderate.
10–30	75–90	70–85	60–75	40–55	20–30	3–7	0.6–2.0	0.12–0.17	4.5–5.5	Low.
10–30	75–90	70–85	60–70	40–60	30–40	11–18	0.6–2.0	0.10–0.17	4.5–5.5	Low.
0–10	70–90	60–85	50–75	40–65	20–35	3–12	0.6–2.0	0.15–0.17	5.6–6.5	Low.
0–5	90–100	85–100	75–95	55–70	15–25	3–9	0.6–2.0	0.16–0.18	5.1–5.5	Low.
0–5	90–100	85–100	70–85	55–75	20–30	5–15	0.6–2.0	0.15–0.20	5.1–5.5	Low.
0	95–100	95–100	90–100	85–95	23–33	5–16	0.6–2.0	0.17–0.20	4.5–5.5	Low.
0	95–100	95–100	90–100	90–95	45–75	20–40	0.2–0.6	0.14–0.17	4.5–5.5	Moderate.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal water table	Depth to bedrock	Depth from surface	Dominant USDA texture	Classification	
					Unified	AASHTO
	Feet	*Feet*	*Inches*			
Sewanee: Sn	1½–2½	4–6	0–48	Loam	CL–ML, ML, CL	A–4
			48–56	Gravelly sandy loam	ML, CL, SM, SC, CL–ML, SM–SC	A–4
Shouns: SoC, SoD	>5	>5	0–18	Silt loam	CL, CL–ML	A–4, A–6
			18–76	Silty clay loam, silt loam, clay loam.	CL	A–6
			76	Siltstone.		
Staser: Ss	>6	>6	0–55	Silt loam, loam, fine sandy loam	CL, CL–ML	A–4, A–6
Statler: St	>6	>6	0–8	Silt loam	CL–ML, ML, CL	A–4
			8–58	Clay loam	CL, CL–ML	A–4, A–6
Sullivan: Su	4–5	4–6	0–32	Loam, silt loam	CL–ML, ML	A–4
			32–58	Gravelly fine sandy loam, fine sandy loam.	ML, SM, SM–SC, CL–ML	A–4, A–2
Taft: Ta	0–1	>5	0–25	Silt loam	CL–ML, CL	A–4
			25–52	Silt loam	CL	A–6
			52–60	Silty clay	CL	A–6, A–7
Talbott: TbC2, TbD2, ToD3, TrD, TrE—Rock outcrop part of TrD and TrE not estimated.	>3½	1½–3½	0–7	Silt loam	ML, CL	A–6, A–7
			7–35	Clay	MH, CH	A–7
			35	Limestone.		
Wallen: WaF, WeF—Rock outcrop part of WeF not estimated.	3½	1½–3½	0–6	Gravelly loam	SM–SC, CL–ML, SM, ML	A–2, A–4
			6–28	Cobbly loam	SM, SM–SC, GM, GM–GC	A–2, A–4, A–1
			28	Sandstone.		
Whitesburg: Ws	1½–2½	3½–5	0–50	Silt loam, silty clay loam	ML, CL	A–4, A–6
			50	Shale.		
Whitwell: Wt	2–3	>5	0–13	Loam	CL–ML, CL	A–4
			13–55	Clay loam, loam	CL	A–4, A–6

[1] NP means nonplastic.

significant to engineering—Continued

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential
	No. 4	No. 10	No. 40	No. 200						
Percent					*Percent*		*Inches per hour*	*Inches per inch of soil*	*pH*	
0–3	90–100	80–95	65–85	52–65	20–30	3–9	0.6–2.0	0.17–0.19	5.1–5.5	Low.
0–5	75–100	65–95	55–80	40–65	20–30	2–7	2.0–6.0	0.09–0.14	5.1–5.5	Low.
0	90–100	85–95	60–90	50–80	25–35	7–14	0.6–2.0	0.16–0.18	5.1–6.0	Low.
0–3	90–100	80–95	60–90	50–85	25–40	11–20	0.6–2.0	0.14–0.17	5.1–6.0	Low.
0	95–100	90–100	70–95	55–85	20–35	4–18	0.6–2.0	0.18–0.22	6.1–7.3	Low.
0	95–100	90–100	80–95	55–75	15–25	4–9	0.6–2.0	0.18–0.22	5.1–6.0	Low.
0	95–100	90–100	80–95	60–80	15–30	5–12	0.6–2.0	0.17–0.20	5.1–6.0	Low.
0	95–100	90–100	65–95	55–85	15–25	2–7	0.6–2.0	0.17–0.22	5.6–7.3	Low.
0–5	65–90	55–85	45–65	30–50	15–25	2–7	2.0–6.0	0.11–0.14	5.6–7.3	Low.
0	100	95–100	90–100	85–95	20–30	5–10	0.6–2.0	0.18–0.20	4.5–5.5	Low.
0–10	95–100	85–100	80–100	80–95	25–35	11–20	0.06–0.2	0.07–0.10	4.5–5.5	Low.
0–15	85–100	80–100	75–95	75–90	30–45	11–20	0.2–0.6	0.12–0.15	4.5–5.5	Low.
0	100	95–100	95–100	90–95	30–45	11–15	0.6–2.0	0.16–0.18	5.1–6.0	Low.
0	100	95–100	95–100	90–100	55–80	25–45	0.2–0.6	0.10–0.14	5.1–7.3	Moderate.
2–10	70–85	65–80	45–70	30–55	NP–25	NP–7	2.0–6.0	0.07–0.12	4.5–5.5	Low.
15–30	35–65	30–60	20–55	15–40	NP–25	NP–7	2.0–6.0	0.05–0.09	4.5–5.5	Low.
0	95–100	90–100	80–90	70–90	30–40	6–15	0.6–2.0	0.15–0.19	6.1–7.8	Low.
0–3	90–100	80–95	60–75	50–70	20–30	5–9	0.6–2.0	0.16–0.18	5.1–5.5	Low.
0–3	90–100	80–95	60–75	50–75	25–35	8–15	0.6–2.0	0.15–0.18	5.1–5.5	Low.

TABLE 8.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The the instructions for referring to other series

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]
Allen:					
AnC	Slight	Severe: slope	Slight	Slight	Slight
AnD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope
AnE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Altivista: At	Severe: wetness	Severe: wetness	Severe: wetness	Moderate: wetness	Severe: wetness
*Bland: BdE	Severe: rock outcrop; depth to rock.	Severe: slope; depth to rock.	Severe: rock outcrop; depth to rock.	Severe: rock outcrop; depth to rock.	Severe: rock outcrop; depth to rock.
Rock outcrop part not rated.					
Bouldin: BoF	Severe: slope; large stones.	Severe: slope; large stones.	Severe: slope; large stones.	Severe: slope; large stones.	Severe: slope; large stones.
*Calvin: CaE, CaF, CcF	Severe: depth to rock; slope.	Severe: slope	Severe: depth to rock; slope.	Severe: slope; depth to rock.	Severe: slope; depth to rock.
For Wallen part of CcF, see Wallen series.					
Claiborne:					
CeC	Slight	Severe: slope	Slight	Slight	Slight
CeD, CeE, CfE3	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Clarksville:					
CkD	Moderate: slope	Severe: slope	Moderate: small stones.	Moderate: slope; small stones.	Moderate: slope
CkE	Severe: slope	Severe: slope	Severe: slope; small stones.	Severe: slope	Severe: slope
Cloudland:					
CoB	Severe: percs slowly.	Moderate: slope	Moderate: wetness	Moderate: wetness	Slight
CoC	Severe: percs slowly.	Severe: slope	Moderate: wetness	Moderate: wetness	Slight
Cynthiana: CyD, CyE	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: slope; depth to rock.	Severe: depth to rock; slope.
Dandridge: DaD, DaE, DaF	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock; slope.
Decatur:					
DcC	Slight	Moderate: slope	Slight	Slight	Moderate: too clayey.
DcD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope; too clayey.
Dewey:					
DeC	Slight	Severe: slope	Slight	Slight	Moderate: too clayey.
DeD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: too clayey; slope.
Dunmore:					
DnC	Moderate: percs slowly.	Severe: slope	Moderate: too clayey.	Slight	Moderate: too clayey.
DnD, DoD	Moderate: slope; percs slowly.	Severe: slope	Moderate: too clayey.	Moderate: slope	Severe: slope; too clayey.
DnE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; too clayey.
Dunning: Du	Severe: floods; percs slowly; wetness.	Severe: floods; wetness.	Severe: floods; to clayey; wetness.	Severe: floods; shrink-swell; wetness.	Severe: floods; wetness.
Ealy: Ea	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods
Emory: Em	Slight	Moderate: seepage	Slight	Slight	Slight
Etowah:					
EtB	Slight	Moderate: slope	Slight	Slight	Slight
EtC	Slight	Severe: slope	Slight	Slight	Slight
EtD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope

engineering properties of the soils

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully that appear in the first column of this table]

Degree and kind of limitation for—Cont'd.		Suitability as source of—		Soil features affecting—	
Local roads and streets	Light industry	Road fill	Topsoil	Pond reservoir areas	Embankments, dikes, and levees
Slight	Moderate: slope	Fair: low strength	Good	Seepage	Favorable.
Moderate: slope	Severe: slope	Fair: low strength; slope.	Fair: slope	Seepage	Favorable.
Severe: slope	Severe: slope	Poor: slope	Poor: slope	Slope	Favorable.
Moderate: wetness.	Moderate: wetness.	Fair: wetness	Fair: wetness	Seepage	Favorable.
Severe: rock outcrop; depth to rock.	Severe: depth to rock; rock outcrop.	Poor: rock outcrop; thin layer.	Poor: too clayey; thin layer.	Depth to rock; slope.	Rock outcrop; thin layer.
Severe: slope; susceptible to slippage.	Severe: slope; large stones.	Poor: slope; large stones.	Poor: slope; large stones.	Slope; seepage	Large stones.
Severe: slope; depth to rock; susceptible to slippage.	Severe: slope; depth to rock.	Poor: slope	Poor: slope; thin layer.	Depth to rock; slope.	Thin layer.
Moderate: low strength.	Moderate: slope	Fair: low strength	Good	Seepage	Piping.
Severe: slope	Severe: slope	Fair to poor: slope.	Poor: slope	Slope; seepage	Piping.
Moderate: slope	Severe: slope	Good	Poor: small stones.	Seepage; slope	Favorable.
Severe: slope	Severe: slope	Poor: slope	Poor: slope; small stones.	Slope; seepage	Favorable.
Moderate: low strength.	Moderate: wetness.	Fair: low strength.	Fair: thin layer	Favorable	Piping.
Moderate: low strength.	Moderate: wetness; slope.	Fair: low strength.	Fair: thin layer	Favorable	Piping.
Severe: depth to rock; slope.	Severe: slope; depth to rock.	Poor: thin layer; slope.	Poor: too clayey	Slope; depth to rock.	Thin layer; rock outcrop.
Severe: depth to rock; slope.	Severe: depth to rock; slope.	Poor: slope; thin layer.	Poor: thin layer; slope.	Depth to rock; slope; shale bedrock is impermeable.	Thin layer.
Moderate: low strength.	Moderate: low strength; slope.	Fair: low strength.	Fair: too clayey; thin layer.	Seepage	Compressible; piping.
Moderate: slope; low strength.	Severe: slope	Fair: slope; low strength.	Fair: too clayey; thin layer.	Seepage; slope	Compressible; piping.
Moderate: low strength.	Moderate: slope; low strength.	Fair: low strength.	Fair: too clayey; thin layer.	Seepage	Compressible; piping.
Moderate: slope; low strength.	Severe: slope	Fair: low strength; slope.	Fair: too clayey; thin layer; slope.	Seepage; slope	Compressible; piping.
Moderate: low strength.	Moderate: low strength; slope.	Poor: low strength.	Poor: too clayey	Seepage	Compressible; piping.
Moderate: slope; low strength.	Severe: slope	Poor: low strength.	Poor: too clayey	Seepage; slope	Compressible; piping.
Severe: slope	Severe: slope	Poor; slope; low strength.	Poor: too clayey	Seepage; slope	Compressible; piping; slope.
Severe: floods; wetness; shrink-swell.	Severe: floods; wetness; shrink-swell.	Poor: wetness; shrink-swell.	Poor: wetness; too clayey.	Floods	Compressible; hard to pack.
Severe: floods	Severe: floods	Fair: low strength.	Good	Seepage; floods	Piping.
Moderate: low strength.	Slight	Fair: low strength.	Good	Seepage	Piping.
Moderate: low strength.	Slight	Fair: low strength.	Good	Seepage	Piping.
Moderate: low strength.	Moderate: slope	Fair: low strength.	Good	Seepage	Piping.
Moderate: slope; low strength.	Severe: slope	Fair: low strength.	Fair: slope	Seepage	Piping.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]
Fullerton:					
FnC	Slight	Severe: slope	Slight	Slight	Moderate: too clayey.
FnD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope; too clayey.
FnE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Gilpin: GpF	Severe: depth to rock; slope.	Severe: slope; depth to rock.	Severe: depth to rock; slope.	Severe: slope	Severe: slope; depth to rock.
Greendale: Gr	Slight	Moderate: seepage.	Slight	Moderate	Slight
Guthrie: Gu	Severe: wetness; percs slowly.	Slight	Severe: wetness	Severe: wetness	Severe: wetness
Hamblen: Ha	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods
Hartsells:					
HeC	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Slight	Severe: depth to rock.
HeD	Severe: depth to rock.	Severe: slope; depth.	Moderate: depth to rock.	Moderate: slope	Severe: depth to rock.
Hayter:					
HhC	Slight	Severe: slope	Slight	Slight	Slight
HhD	Moderate: slope	Severe: slope	Slight	Moderate: slope	Moderate: slope
HhE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
HkD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope
HkE, HkF	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Holston:					
HoB	Slight	Moderate: slope	Slight	Slight	Slight
HoC, Hx. Properties of Urban land part of Hx are too variable for interpretations to be made.	Slight	Severe: slope	Slight	Slight	Slight
HoD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope
Jefferson:					
JeC	Slight	Moderate: slope	Slight	Slight	Slight
JeD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope
JfC	Slight	Severe: slope	Moderate: small stones.	Slight	Slight
JfD	Moderate: slope	Severe: slope	Moderate: small stones.	Moderate: slope	Moderate: slope
JfE	Severe: slope	Severe: slope	Severe: slope; susceptible to slippage.	Severe: slope	Severe: slope
Leadvale:					
LaB	Severe: percs slowly.	Moderate: slope	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
LaC	Severe: percs slowly.	Severe: slope	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Leesburg: LbD	Moderate: slope	Severe: slope	Moderate: small stones.	Moderate: slope; small stones.	Moderate: slope
Lehew: LeF	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.
Lindside: Ln	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods; wetness.

properties of the soils—Continued

Degree and kind of limitation for—Cont'd.		Suitability as source of—		Soil features affecting—	
Local roads and streets	Light industry	Road fill	Topsoil	Pond reservoir areas	Embankments, dikes, and levees
Moderate: low strength.	Moderate: slope	Fair: low strength	Poor: small stones	Seepage	Compressible.
Moderate: slope; low strength.	Severe: slope	Fair: low strength; slope.	Poor: small stones	Seepage; slope	Compressible.
Severe: slope	Severe: slope	Poor: slope	Poor: small stones; slope.	Seepage; slope	Compressible.
Severe: slope; depth to rock.	Severe: slope	Poor: slope; thin layer.	Poor: slope; small stones.	Slope; depth to rock	Thin layer.
Moderate: low strength.	Slight	Fair: low strength	Good	Seepage	Piping.
Severe: wetness	Severe: wetness	Poor: wetness; low strength.	Poor: wetness	Favorable	Piping.
Severe: floods	Severe: floods	Fair: low strength	Good	Favorable	All features favorable.
Moderate: depth to rock.	Moderate: slope	Fair: thin layer	Good	Seepage	Thin layer.
Severe: depth to rock; slope.	Severe: slope	Fair: thin layer	Fair: slope	Seepage; slope	Thin layer.
Slight	Moderate: slope	Fair: low strength	Good	Seepage	Piping.
Moderate: slope; susceptible to slippage.	Severe: slope	Fair: low strength.	Fair: slope	Seepage; slope	Piping.
Severe: susceptible to slippage; slope.	Severe: slope	Poor: slope	Poor: slope	Seepage; slope	Piping.
Moderate: slope; susceptible to slippage.	Severe: slope	Fair: low strength	Fair: small stones	Seepage; slope	Piping.
Severe: susceptible to slippage; slope.	Severe: slope	Poor: slope	Poor: slope; small stones.	Seepage; slope	Piping.
Moderate: low strength.	Slight	Fair: low strength	Good	Favorable; underlain by impervious shale.	Piping.
Moderate: low strength.	Moderate: slope	Fair: low strength	Good	Favorable; underlain by impervious shale.	Piping.
Moderate: slope; low strength.	Severe: slope	Fair: slope; low strength.	Fair: slope	Slope	Piping.
Slight	Moderate: slope	Good	Good	Seepage	All features favorable.
Moderate: slope; susceptible to slippage.	Severe: slope	Good	Poor: slope	Seepage; slope	All features favorable.
Slight	Moderate: slope	Good	Poor: small stones	Seepage	All features favorable.
Moderate: slope; susceptible to slippage.	Severe: slope	Good	Poor: small stones	Seepage; slope	All features favorable.
Severe: susceptible to slippage; slope.	Severe: slope	Poor: slope	Poor; small stones; slope.	Slope	All features favorable.
Moderate: low strength; wetness.	Moderate: wetness	Fair: low strength	Fair: thin layer	Favorable	Piping.
Moderate: low strength; wetness.	Moderate: slope	Fair: low strength	Fair: thin layer	Favorable	Piping.
Moderate: slope	Severe: slope	Good	Poor: small stones	Slope; seepage	All features favorable.
Severe: slope; susceptible to slippage.	Severe: slope	Poor: slope; thin layer.	Poor: slope; thin layer.	Slope; depth to rock	Thin layer.
Severe: floods	Severe: floods	Fair: low strength	Good	Seepage	Piping.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]
Litz: LzD, LzE, LzE3, LzF	Severe: percs slowly; slope.	Severe: slope; depth to rock.	Severe: depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.
Melvin: Ma	Severe: floods; wetness.	Severe: floods; wetness.	Severe: floods: wetness.	Severe: floods; wetness.	Severe: floods; wetness.
Minvale:					
MeB	Slight	Moderate: slope; seepage.	Slight	Slight	Slight
MeC	Slight	Severe: slope	Slight	Slight	Slight
MeD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope
*Montevallo: MnD, MnE, MoE For Talbott part of MoE, see Talbott series.	Severe: depth to rock; slope.	Severe: slope; depth to rock.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: slope; depth to rock.
Needmore: NdB, NdC	Severe: percs slowly.	Moderate: depth to rock.	Severe: depth to rock; too clayey.	Moderate: depth to rock.	Severe: too clayey; depth to rock.
Nella:					
NeC	Slight	Moderate to severe: slope; seepage.	Slight	Slight	Slight
NeD	Moderate: slope	Severe: slope	Slight	Moderate: slope	Moderate: slope
NeE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
*Rock outcrop-Talbott complex: RtE. Rock outcrop part not rated. For Talbott part, see Talbott series.					
Sensabaugh: Sa	Moderate: wetness	Severe: floods; percs rapidly.	Moderate to slight: small stones.	Severe: floods	Severe: floods
Sequatchie: Se	Slight	Moderate: percs rapidly.	Slight	Slight	Slight: deep trenches may extend to water table.
Sequoia:					
SkC2	Severe: percs slowly.	Moderate to slight: slope.	Severe: too clayey; depth to rock.	Moderate: low strength.	Severe: too clayey; depth to rock.
SkD2	Severe: percs slowly.	Severe: slope	Severe: too clayey; depth to rock.	Moderate: slope; low strength.	Severe: too clayey; depth to rock.
Sewanee: Sn	Severe: floods; wetness.	Severe: floods; wetness.	Severe: floods; wetness.	Severe: floods; wetness.	Severe: floods
Shouns:					
SoC	Slight	Moderate to severe: slope.	Slight	Slight	Slight
SoD	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope
Staser: Ss	Severe: floods	Severe: floods	Slight	Severe: floods	Severe: floods
Statler: St	Slight	Moderate: seepage	Slight	Slight	Moderate: in places deep trenches extend to water table.
Sullivan: Su	Severe: floods	Severe: floods	Severe: floods:	Severe: floods	Severe: floods
Taft: Ta	Severe: wetness; percs slowly.	Slight	Severe: wetness	Severe: wetness	Severe: wetness
Talbott: TbC2, TbD2, ToD3, TrD, TrE Rock outcrop part of TrD not rated.	Severe: percs slowly.	Severe: depth to rock.	Severe: too clayey; depth to rock.	Moderate to severe: shrink-swell.	Severe: depth to rock; too clayey.
Wallen: WaF, WeF Rock outcrop part of WeF not rated.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.
Whitesburg: Ws	Severe: wetness	Moderate: receives runoff.	Slight	Severe: receives runoff.	Severe: receives runoff.
Whitwell: Wt	Severe: wetness	Severe	Severe: wetness	Severe: wetness	Severe: wetness

[1] Onsite studies of the underlying strata, water table, and hazards of aquifer pollution and drainage into ground water need to be made for landfills.

properties of the soils—Continued

Degree and kind of limitation for—Cont'd.		Suitability as source of—		Soil features affecting—	
Local roads and streets	Light industry	Road fill	Topsoil	Pond reservoir areas	Embankments, dikes, and levees
Severe: slope; depth to rock.	Severe: slope	Poor: low strength; thin layer; slope.	Poor: small stones.	Slope; shale is impermeable.	Thin layer.
Severe: floods	Severe: floods; wetness.	Poor: wetness	Poor: wetness	Seepage	Piping.
Moderate: low strength.	Slight	Fair to good: low strength.	Good to fair: small stones; thin layer.	Seepage	All features favorable.
Moderate: low strength.	Moderate: slope	Fair to good: low strength.	Good to fair: small stones; thin layer.	Seepage	All features favorable.
Moderate: low strength; slope.	Severe: slope	Fair to good: low strength.	Good to fair: small stones; thin layer.	Seepage; slope	All features favorable.
Severe: slope; depth to rock.	Severe; slope; depth to rock.	Fair: thin layer	Poor: small stones.	Slope; shale bedrock impermeable.	Thin layer.
Severe: low strength.	Moderate: depth to rock.	Poor: low strength.	Poor: too clayey	Favorable	Compressible; thin layer.
Slight	Moderate: slope	Good	Fair: small stones.	Seepage	All features favorable.
Moderate: slope; susceptible to slippage.	Severe: slope	Good	Fair: small stones.	Seepage; slope	All features favorable.
Severe: slope; susceptible to slippage.	Severe: slope	Poor: slope	Poor: slope	Slope	All features favorable.
Moderate: floods	Severe: floods	Good	Fair to poor: small stones.	Seepage	Favorable.
Moderate: low strength.	Slight	Good to fair: low strength.	Good	Seepage	Favorable.
Severe: low strength.	Moderate: shrink-swell.	Poor: low strength.	Poor: too clayey	Favorable	Compressible; thin layer.
Severe: low strength; slope.	Severe: slope	Poor: low strength.	Poor: too clayey	Favorable	Compressible; thin layer.
Severe: floods; wetness.	Severe: floods; wetness.	Fair: wetness	Fair: wetness	Seepage	Favorable.
Slight	Moderate: slope	Good	Good to fair: thin layer.	Seepage	Favorable.
Moderate: slope	Severe: slope	Good	Good to fair: thin layer.	Seepage; slope	Favorable.
Severe: floods	Severe: floods	Fair: low strength.	Good	Seepage	Piping.
Moderate: low strength.	Slight	Fair: low strength.	Good	Seepage	Piping.
Severe: floods	Severe: floods	Fair: low strength.	Good	Seepage	Piping.
Severe: wetness	Severe: wetness	Poor: low strength; wetness.	Poor: wetness	Favorable	Piping.
Severe: low strength; depth to rock.	Moderate to severe: depth; shrink-swell; slope.	Poor: low strength.	Poor: too clayey	Cavernous limestone at a depth of 20 to 40 inches.	Compressible.
Severe: slope; depth to rock.	Severe: slope; depth to rock.	Poor: slope	Poor: slope; small stones.	Slope: depth to rock.	Thin layer.
Moderate: wetness.	Moderate: receives runoff.	Fair: low strength.	Fair: clayey	Favorable	Piping.
Moderate: wetness.	Severe: wetness	Fair: low strength; wetness.	Fair: wetness	Seepage	Piping.

in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Engineering interpretations of soils

The estimated interpretations in table 8 are based on the engineering properties of soils shown in table 7, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Hawkins and Hancock Counties. In table 8, ratings are used to summarize limitations or suitability of the soils for all listed purposes other than for pond reservoirs and embankments, dikes, and levees. For these particular uses, table 8 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means soil properties generally are favorable for the rated use, or in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation and special designs.

Soil suitability is rated by the terms good, fair, and poor, which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Soil features not to be overlooked in the planning, installation, and maintenance of pond reservoirs, embankments, dikes, and levees are listed for each soil in table 8.

Following are explanations of the columns in table 8.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table, rock or other impervious layers, and susceptibility to flooding. If drainage is poor, or flooding is frequent, other properties have little bearing on the rating. Slope is a soil property that affects difficulty of layout and construction and the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. Sewage lagoons require consideration of the soil for two functions: as a vessel for the impounded area, and as soil material for the dam or embankment. Adequate soil material must be available that is suitable for the structure, and when properly constructed, the lagoon must be capable of holding water with minimum seepage. A lagoon has a nearly level floor and sides or embankments of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic-matter content, and slope; and if the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified classification and the amount of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet; for example, excavations for underground utility lines (pipelines, sewers, cables), cemeteries, basements, and open ditches. Soil properties considered in this use are depth to bedrock, stoniness, rockiness, water table, flooding, slope, and texture. Additional interpretations concerning shrink-swell potential and corrosivity are needed for giving ratings for the ultimate use of soils for pipelines.

Dwellings without basements as rated in table 8 are single-family dwellings or other structures not more than three stories high and are supported by foundation footings placed on undisturbed soil. The emphasis in rating soils for dwellings is on the properties that affect foundations, but also considered are slope, susceptibility to flooding, seasonal wetness, and other hydrologic conditions. The properties influencing foundation support are those affecting bearing capacity and settlement under load. Properties affecting bearing strength and settlement of the natural soil are density, wetness, flooding, plasticity, texture, and shrink-swell potential. Also considered are soil properties, particularly depth to bedrock, that influence installation of utility lines. Onsite investigations are needed for specific placement of buildings and utility lines and for detailed design of foundations.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfills are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. Criteria used to determine ratings for sanitary landfills are drainage, depth to water table, flooding, permeability, texture, slope, depth to bedrock, stoniness, and rockiness. Data given in this report cannot be substituted for geologic investigations, because soil borings are normally limited to depths of 5 to 6 feet, whereas many sanitary landfills are made to depths of 10 to 15 feet. These interpretations are useful in preliminary determinations of sanitary landfill sites, thus saving time and expense of more detailed investigations.

Local roads and streets, as rated in table 8, have some kind of all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep. Soil properties that most affect design and construction of roads and streets are those affecting the load supporting capacity and stability of the subgrade and those affecting the workability and amount of cut and fill. The AASHTO and Unified classifications of the soil material and the shrink-swell potential give an indication of the load supporting capacity. Wetness and flooding affect the stability of the material. Slope, depth to hard rock, stoniness, rockiness, and wetness affect the ease of excavation.

Light industry is limited to structures other than dwellings three stories or less in height. Ratings are for undisturbed soil that is used to support building foundations. Emphasis is on foundations and the ease of excavation for underground utilities. Soil properties affecting load-supporting capacity and settlement under load are wetness, flooding, texture, plasticity, density, and shrink-swell potential. Properties affecting excavation are wetness, flooding, slope, and depth to bedrock.

Road fill is soil material used for making embankments for roads. Because low embankments or the upper part of high embankments serve as the subgrade for roads, soil material for road fill also needs to be good for the subgrade. Suitability ratings are given for the whole soil from the surface to a depth of 5 or 6 feet based on the assumption that soil horizons will be mixed in loading, dumping, and spreading operations. These ratings reflect the predicted performance of the soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage, and the relative ease of excavating the material at borrow areas. Soil properties considered in these ratings are the AASHTO and Unified classifications of the soil material, shrink-swell potential, slope, stoniness, rockiness, and drainage.

Topsoil is soil material used for topdressing areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material; natural fertility of the material or the response of plants when fertilizer is applied; and the absence or presence of substances toxic to plants. Soil properties considered are texture, consistence, coarse fragments, stoniness, and rockiness. Also considered are certain features that affect the ease of excavating the material, particularly slope, wetness, and thickness of suitable material. Soils having less than 8 inches of favorable material are considered unsuitable as a source of topsoil.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Formation and Classification of the Soils

This section discusses the effects of the five factors of soil formation on the soils in the survey area. The system of soil classification is also explained, and the soil series in the county are placed in some categories of this system.

Factors of Soil Formation

Soils differ from one another because of differences in the materials in which they formed and different environments acting upon them. By studying the characteristics of an existing soil, one can largely reconstruct the stages and many of the interrelated processes of its formation. The characteristics of a soil provide a basis for its placement in the nationwide scheme of soil classification.

Soils form as the result of the interaction of five major factors: *parent material*, acted upon by *climate* and living *organisms*, as influenced by *topography* and *time*. All five factors influence the formation of every soil, but each factor varies in its degree of expression from place to place. The effect of any one factor is modified to some degree by the other four. It would be difficult to overemphasize the extreme complexity of the interactions of these five factors and the infinite degrees of their expression in soils.

Each of the five factors of soil formation is discussed briefly in the paragraphs that follow.

Parent material

Parent material is the unconsolidated mass from which a soil forms. In Hawkins and Hancock Counties, most of the soils formed in chemically altered materials weathered from the underlying rock. The kind of parent material determines the limits of the mineralogical and chemical characteristics of the soil that formed in it.

As the rocks exposed to weathering in this survey area were largely shale, siltstone, sandstone, and limestone, the residual soils of the area reflect certain inherited characteristics of those kinds of parent materials. For example, the Dunmore, Decatur, Sequoia, and Needmore soils are high in clay content but contain little sand. They formed in clayey material weathered from limestone and shale. The Hartsells and Wallen soils contain a high percentage of sand. They formed in sandy materials weathered from sandstone.

Some of the soils in this survey area formed in parent materials that have been moved downslope or downstream from the place where they were released upon weathering of the parent rock. Material that has rolled down steep slopes is classified as colluvium, and material deposited on bottom land by water is known as alluvium. The Minvale, Shouns, Jefferson, Hayter, and Allen soils formed in old colluvial deposits, and the Holston, Taft, and Guthrie soils formed in old alluvial deposits.

Although some mixing of parent materials from different sources has occurred because of such movement, sometimes over long distances, the soils that formed in alluvial and colluvial deposits commonly show strong inherited characteristics that indicate the origin of the deposits. Thus the Shouns soils are notable for their silt content and the common occurrence of reddish siltstone and shale fragments within their profile. They are on colluvial foot slopes below steep areas of siltstone and shale. The Jefferson and Allen soils are rather high in sand content and have some sandstone fragments, which shows that the source of their parent materials was mainly sandstone. Soils that formed in alluvial deposits may have formed from materials that washed from nearby slopes, as in the case of Greenvale, Emory, and Whitesburg soils, or from many points upstream along a major river and its tributaries, as in the case of the Holston, Statler, and other soils of the river bottoms and terraces.

Climate

Climate directly affects the accumulation of parent material and the development of soil horizons. It regulates the speed of the weathering of rocks, the chemical altering of minerals, and the processes of leaching, eluviation, and illuviation. Indirectly, climate determines the kind of plants and animals that can thrive in a particular region.

The climate of this survey area is warm, humid, and temperate. Winters are moderate, and the ground freezes only to a depth of a few inches, and only for short periods. The summers are warm and, for the most part, moist. A mild, humid climate favors rapid physical and chemical decomposition of rocks, minerals, and organic matter. Intensive leaching, eluviation, illuviation, and oxidation are favored, and the resulting soils are generally moderate to low in organic matter, low in bases, and strongly oxidized.

The relatively small local differences in climate caused by variations in slope, aspect, and drainage affect soil formation to some extent. On steep slopes facing south and west, the average daily temperature is higher than on similar slopes facing north and east because the soils are in sunlight for longer periods and radiation is received at a more nearly direct angle, resulting in high absorption of solar radiation. Because of the higher resulting temperature, decomposition of organic matter and physical and chemical reactions are more rapid. Consequently, mature soils on west- and south-facing slopes have a lower average moisture content, less organic matter, and generally a lighter colored surface layer than soils on east- and north-facing slopes. For example, Clarksville soils are commonly on west- and southwest-facing slopes, Fullerton soils are on south-facing slopes, and Claiborne soils are on east- and north-facing slopes.

The kind of vegetation that grows is also influenced by differences in exposure. For example, dominant species on south- and west-facing slopes of dolomitic ridges are generally oaks and hickory, and yellow-poplar, gum, and oaks are on east- and north-facing slopes of the same ridge.

Living organisms

Many of the processes by which parent material is transformed into soil are strongly influenced by living organisms and their remains and by-products. Plant remains make up the major part of the organic matter that is incorporated into a soil. Other organisms, including earthworms, fungi, bacteria, insects, and various microorganisms, also contribute to the organic-matter content of a soil.

Both physical and chemical changes in soils are brought about by organisms. Mechanical mixing, separating of soil and rock particles, and reconstitution are the result of physical ingestion by simpler animals, tunnel and burrow formation, and the prying and penetrating action of roots. These mechanical changes in the soil result in deeper water and air penetration and serve to deepen chemical weathering.

Plant roots absorb nutrients from deep in the soil material and transport them into leaf, twig, and stem tissues, which eventually die, fall to the soil surface, and enrich the surface. Organic acids resulting from the decay of organisms leach downward in the soil, removing bases and chemically altering clay minerals.

The soils in this survey area formed under a forest of hardwoods that included scattered stands of pine and cedar. Differences existed in the density of the stands, in the relative proportions of species, and in the kinds of associated ground cover. However, these differences were not sufficient to account for the marked differences in properties among the mature, well-drained soils of the survey area.

Topography

Topography, including slope, relief, and aspect, influences or modifies the effects of the other four soil-forming factors. Other things being equal, steeper soils are shallower, have less horizon differentiation, and lose more water and soil material as a result of runoff and erosion than the more nearly level soils. For example, the steep, shallow, shaly Dandridge soils have little horizon development because erosion removes soil material about as fast as it forms from the underlying shale. The moderately deep, clayey Needmore soils formed in less sloping areas from the same shale. The aspect, or exposure, in relation to the sun alters, in varying degrees, the microclimate and the kind and amounts of plant and animal life in and on the soil.

Topography is determined mainly by the underlying rock, by the geologic history of the region, and by the action of moving water. The present topography of Hawkins and Hancock Counties is a result of the faulting and folding of underlying sedimentary rock strata (fig. 19), which have been acted upon by geologic erosion over millions of years. Areas of soluble limestone have been eroded to form valleys, and shale areas have been worn down to form somewhat narrower valleys. The principal ridges are protected to some extent by caps of more resistant sandstone and siltstone.

Elevation ranges from about 1,040 feet to about 3,100 feet in the survey area. In some locations, differences in elevation of more than 1,000 feet are found within a horizontal distance of less than a mile. This is the case in the vicinity of Clinch Mountain and Poor Valley. Such surfaces are slowly but constantly being leveled. Other areas, notably on the broader high stream terraces, are nearly level. Because these areas are above present-day flood levels, they more nearly approach a state of equilibrium, allowing the other soil-forming factors to hasten soil maturity.

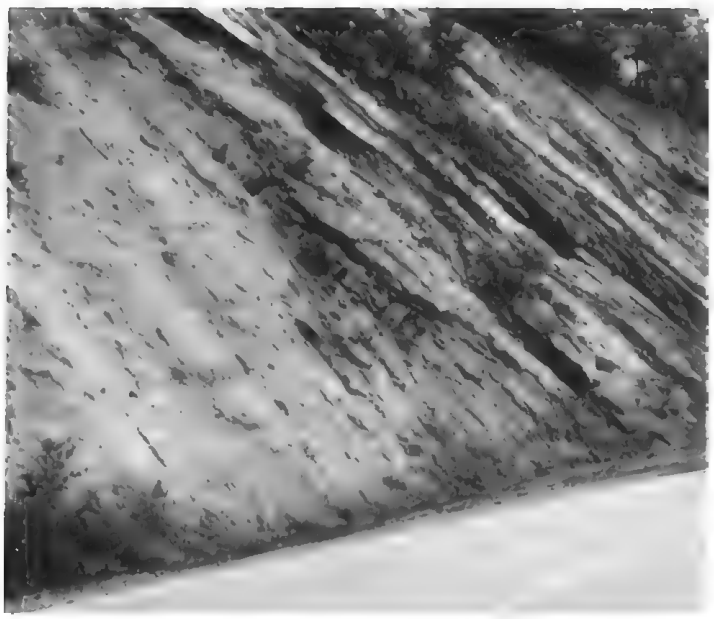

***Figure 19.*—Cut in sandstone on Clinch Mountain. The thin soil is a Wallen gravelly loam.**

Time

The time required for a soil to form depends on the combined influences of the other factors of soil formation. Accumulation of parent material generally takes much more time than is required for the development of soil horizons. Less time is generally required for a soil to form in a warm, humid region having luxuriant vegetation than in a dry, cold region having sparse vegetation. Less time is required if the parent material is permeable, on gentle slopes, and chemically weatherable than if it is slowly permeable, chemically inert, and on steeper slopes.

The soils of Hawkins and Hancock Counties range in relative age from young to very old. Most of the soils on first bottoms, in depressions, and along small drainageways are young. Examples include Lindside, Ealy, Hamblen, Emory, and Greendale soils. They consist of geologically young deposits that have weakly developed or undeveloped genetic profiles. The old, or mature, soils formed in parent material that has remained in place for a long time, perhaps millions of years, and has reached an approximate state of environmental equilibrium. Mature soils commonly have thicker, more numerous genetically related horizons and more strongly weathered parent material than do younger soils.

Parent material of soils on bottom lands and adjacent stream terraces generally represents sequential ages of weathering. In order of increasing age, for example, Staser soils are on bottom lands, and Statler soils are on low terraces of intermediate age. Sequatchie soils are on somewhat higher, older terraces, and Holston soils are on the oldest, highest terraces.

Classification of Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge to farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and revised later (*5*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*4*) and was adopted in 1965 (*7*). This system is under continual study.

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 9 shows the classification of each soil series in Hawkins and Hancock Counties by family, subgroup, and order according to the current system.

Except for the soil series, the classes that make up the current system are defined briefly in the following paragraphs. Soil series is defined in the section "How This Survey Was Made." A detailed description of each soil series in the county is given in the section "Descriptions of the Soils."

ORDER: Ten soil orders are recognized in the current system of classification. They are Alfisols, Aridisols, Entisols, Histosols, Inceptisols, Mollisols, Oxisols, Spodosols, Ultisols, and Vertisols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Three exceptions are Entisols, Histosols, and Inceptisols, which occur in many climates.

Five of the soil orders are represented in Hawkins and Hancock Counties. They are Alfisols, Entisols, Inceptisols, Mollisols, and Ultisols.

Alfisols have an accumulation of aluminum and iron, argillic or natric horizons, and a base saturation of more than 35 percent.

Entisols are recent mineral soils that have little, if any, horizon development.

Inceptisols are mineral soils that formed mostly in young, but not recent material.

Mollisols are mineral soils that have a thick, dark-colored surface layer, moderate or strong structure, and a base saturation of more than 50 percent.

Ultisols have a clay-enriched B horizon and base saturation less than 35 percent.

SUBORDER: Each order is divided into suborders, mainly on the basis of soil characteristics that produce classes having genetic similarity. A suborder has a narrow climatic range than an order. The criteria for suborders reflect either the presence or absence of waterlogging or soil differences resulting from climate or vegetation.

GREAT GROUP: Each suborder is divided into great groups on the basis of uniformity in the kind and sequence of genetic horizons.

SUBGROUP: Each great group is divided into subgroups, one representing the central (typic) concept of the group, and others, called intergrades, made up of soils that have mostly the properties of one great group but also one or more properties of another great group.

FAMILY: Families are established within subgroups, mainly on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

Literature Cited

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69 *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp. illus.

(3) Baldwin, Mark, Kellogg, Charles E., and Thorp, James. 1938. Soil classification. U.S. Dept. of Agric. Yearb. 1938: pp. 979–1001, illus.

(4) Simonson, Roy W. 1962. Soil classification in the United States. Sci. 137: 1027–1034, illus.

(5) Thorp, James, and Smith, Guy D. 1949. Higher categories of soil classification: order, suborder, and great soil groups. Soil Sci. 67: 117–126.

(6) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dept. of Agric. Handb. 18, 503 pp., illus. [Supplement issued in May 1962]

(7) ————. 1960. Soil classification, a comprehensive system,

TABLE 9.—*Classification of soil series*

Series	Family	Subgroup	Order
Allen	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Altavista	Fine-loamy, mixed, thermic	Aquic Hapludults	Ultisols.
Bland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Bouldin	Loamy-skeletal, siliceous, mesic	Typic Paleudults	Ultisols.
Calvin	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Claiborne	Fine-loamy, siliceous, mesic	Typic Paleudults	Ultisols.
Clarksville	Loamy-skeletal, siliceous, mesic	Typic Paleudults	Ultisols.
Cloudland	Coarse-loamy, siliceous, thermic	Glossic Fragiudults	Ultisols.
Cynthiana	Fine, mixed, mesic	Lithic Hapludalfs	Alfisols.
Dandridge	Clayey-skeletal, mixed, mesic	Lithic Ruptic-Alfic Eutrochrepts	Inceptisols.
Decatur	Clayey, kaolinitic, thermic	Rhodic Paleudults	Ultisols.
Dewey	Clayey, kaolinitic, thermic	Typic Paleudults	Ultisols.
Dunmore	Clayey, kaolinitic, mesic	Typic Paleudults	Ultisols.
Dunning	Fine, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Ealy	Coarse-loamy, siliceous, mesic	Fluventic Dystrochrepts	Inceptisols.
Emory	Fine-silty, siliceous, thermic	Fluventic Umbric Dystrochrepts	Inceptisols.
Etowah	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Fullerton	Clayey, kaolinitic, thermic	Typic Paleudults	Ultisols.
Gilpin	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Greendale	Fine-loamy, siliceous, mesic	Fluventic Dystrochrepts	Inceptisols.
Guthrie	Fine-silty, siliceous, thermic	Typic Fragiaquults	Ultisols.
Hamblen	Fine-loamy, siliceous, thermic	Fluvaquentic Eutrochrepts	Inceptisols.
Hartsells	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols.
Hayter	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Holston	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Jefferson	Fine-loamy, siliceous, mesic	Typic Hapludults	Ultisols.
Leadvale	Fine-silty, siliceous, thermic	Typic Fragiudults	Ultisols.
Leesburg	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Lehew	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Lindside	Fine-silty, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Litz	Loamy-skeletal, mixed, mesic	Ruptic-Ultic Dystrochrepts	Inceptisols.
Melvin	Fine-silty, mixed, nonacid, mesic	Typic Fluvaquents	Entisols.
Minvale	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Montevallo	Loamy-skeletal, mixed, thermic, shallow	Typic Dystrochrepts	Inceptisols.
Needmore	Fine, mixed, mesic	Ultic Hapludalfs	Alfisols.
Nella	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Sensabaugh	Fine-loamy, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Sequatchie	Fine-loamy, siliceous, thermic	Humic Hapludults	Ultisols.
Sequoia	Clayey, mixed, mesic	Typic Hapludults	Ultisols.
Sewanee	Coarse-loamy, siliceous, mesic	Fluvaquentic Dystrochrepts	Inceptisols.
Shouns	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Staser	Fine-loamy, mixed, thermic	Cumulic Hapludolls	Mollisols.
Statler	Fine-loamy, mixed, thermic	Humic Hapludults	Ultisols.
Sullivan	Fine-loamy, siliceous, thermic	Dystric Fluventic Eutrochrepts	Inceptisols.
Taft	Fine-silty, siliceous, thermic	Glossaquic Fragiudults	Ultisols.
Talbott	Fine, mixed, thermic	Typic Hapludalfs	Alfisols.
Wallen	Loamy-skeletal, siliceous, mesic	Typic Dystrochrepts	Inceptisols.
Whitesburg	Fine-loamy, siliceous, mesic	Aquic Dystric Eutrochrepts	Inceptisols.
Whitwell	Fine-loamy, siliceous, thermic	Aquic Hapludults	Ultisols.

7th approximation. 265 pp., illus. [Supplements issued in March 1967 and in September 1968]

(8) ————. 1971. Forest statistics for Tennessee counties. Southern Forest Expt. Sta. Forest Service Resource Bull. SO–32. 58 pp., illus.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Compressible. The soil is relatively soft and decreases excessively in volume when a load is applied.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concre-

tions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Depth to rock. Bedrock is so near the surface that it affects specified use of the soil.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Favorable, Features of the soil are favorable for the intended use.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Low strength. The soil has inadequate strength to support loads.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Percs slowly. Water moves through the soil slowly, affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil series or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Piping. The soil is susceptible to the formation of tunnels or pipelike cavities by moving water.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Only the upper part of this, modified by organisms and other soil-building forces, is regarded by soil scientists as soil. Most American engineers speak of the whole regolith, even to great depths, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Seepage. Water moves through the soil so quickly that it affects the specified use.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Site index. A numerical means of expressing the quality of a forest site that is based on the height of the dominant stand at an arbitrarily chosen age; for example, the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless soils* are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Suitable soil material is not thick enough for use as borrow material or topsoil.

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. For complete information about a capability unit, read both the introduction "Use of the Soils for Crops and Pasture" and the description of the capability unit in this section. For information about the suitability of soils for woodland and wildlife, read the introduction to these sections and refer to the tables in each section.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
AnC	Allen loam, 5 to 12 percent slopes	13	IIIe-1	50	3o7
AnD	Allen loam, 12 to 20 percent slopes	13	IVe-1	52	3o7
AnE	Allen loam, 20 to 35 percent slopes	13	VIe-1	52	3r8
At	Altavista silt loam	14	IIw-1	50	2w8
BdE	Bland-Rock outcrop complex, 20 to 40 percent slopes	14	VIIs-1	53	5x3
BoF	Bouldin cobbly loam, 20 to 60 percent slopes	15	VIIs-1	53	3x9
CaE	Calvin silt loam, 15 to 35 percent slopes	15	VIe-3	53	4f3
CaF	Calvin silt loam, 35 to 60 percent slopes	16	VIIe-1	53	4f3
CcF	Calvin-Wallen complex, 25 to 60 percent slopes	16	VIIe-1	53	4f3
CeC	Claiborne silt loam, 5 to 12 percent slopes	16	IIIe-1	50	3o7
CeD	Claiborne silt loam, 12 to 25 percent slopes	16	IVe-1	52	3o7
CeE	Claiborne silt loam, 25 to 40 percent slopes	17	VIe-1	52	3r8
CfE3	Claiborne soils, 15 to 35 percent slopes, severely eroded	17	VIe-1	52	3r8
CkD	Clarksville cherty silt loam, 5 to 20 percent slopes	18	VIe-1	52	3f8
CkE	Clarksville cherty silt loam, 20 to 40 percent slopes	18	VIIe-1	53	4f3
CoB	Cloudland loam, 2 to 5 percent slopes	18	IIe-2	49	3o7
CoC	Cloudland loam, 5 to 12 percent slopes	19	IIIe-5	51	3o7
CyD	Cynthiana flaggy silty clay loam, 5 to 20 percent slopes	19	VIIs-1	53	4x3
CyE	Cynthiana flaggy silty clay loam, 20 to 50 percent slopes	19	VIIs-1	53	4x3
DaD	Dandridge shaly silty clay loam, 5 to 20 percent slopes	20	VIe-3	53	4d3
DaE	Dandridge shaly silty clay loam, 20 to 35 percent slopes	20	VIe-3	53	4d3
DaF	Dandridge shaly silty clay loam, 35 to 60 percent slopes	20	VIIe-1	53	4d3
DcC	Decatur silt loam, 5 to 12 percent slopes	21	IIIe-2	50	3o7
DcD	Decatur silt loam, 12 to 20 percent slopes	21	IVe-1	52	3o7
DeC	Dewey silt loam, 5 to 12 percent slopes	21	IIIe-2	50	3o7
DeD	Dewey silt loam, 12 to 20 percent slopes	21	IVe-1	52	3o7
DnC	Dunmore silt loam, 5 to 12 percent slopes	22	IIIe-2	50	3o7
DnD	Dunmore silt loam, 12 to 20 percent slopes	22	IVe-1	52	3o7
DnE	Dunmore silt loam, 20 to 35 percent slopes	22	VIe-1	52	3r8
DoD	Dunmore silty clay loam, 12 to 25 percent slopes	23	VIe-1	52	4c3e
Du	Dunning silty clay loam	23	IIIw-1	51	2w9
Ea	Ealy loam	24	I-1	49	2o7
Em	Emory silt loam	24	I-1	49	2o7
EtB	Etowah silt loam, 2 to 5 percent slopes	25	IIe-1	49	2o7
EtC	Etowah silt loam, 5 to 12 percent slopes	25	IIIe-1	50	2o7
EtD	Etowah silt loam, 12 to 25 percent slopes	25	IVe-1	52	2o7
FnC	Fullerton cherty silt loam, 5 to 12 percent slopes	26	IIIe-3	50	3o7
FnD	Fullerton cherty silt loam, 12 to 20 percent slopes	27	IVe-2	52	3o7
FnE	Fullerton cherty silt loam, 20 to 35 percent slopes	27	VIe-1	52	3r8
GpF	Gilpin silt loam, 25 to 50 percent slopes	27	VIIe-1	53	3r8
Gr	Greendale silt loam	28	I-1	49	2o7
Gu	Guthrie silt loam	28	IVw-1	52	2w9
Ha	Hamblen silt loam	29	IIw-1	50	2w8
HeC	Hartsells loam, 3 to 12 percent slopes	29	IIIe-1	50	4o1
HeD	Hartsells loam, 12 to 20 percent slopes	29	IVe-1	52	4o1
HhC	Hayter loam, 3 to 12 percent slopes	30	IIIe-1	50	2o7
HhD	Hayter loam, 12 to 20 percent slopes	30	IVe-1	52	2o7
HhE	Hayter loam, 20 to 35 percent slopes	31	VIe-1	52	2r8
HkD	Hayter cobbly loam, 10 to 20 percent slopes	31	IVe-1	52	2o7
HkE	Hayter cobbly loam, 20 to 35 percent slopes	31	VIe-1	52	2r8
HkF	Hayter cobbly loam, 35 to 55 percent slopes	31	VIIe-1	53	2r8
HoB	Holston loam, 2 to 5 percent slopes	32	IIe-1	49	3o7
HoC	Holston loam, 5 to 12 percent slopes	32	IIIe-1	50	3o7
HoD	Holston loam, 12 to 20 percent slopes	32	IVe-1	52	3o7

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
Hx	Holston-Urban land complex	32	------	--	---
JeC	Jefferson loam, 5 to 12 percent slopes	33	IIIe-1	50	3o7
JeD	Jefferson loam, 12 to 20 percent slopes	33	IVe-1	52	3o7
JfC	Jefferson cobbly loam, 5 to 12 percent slopes	33	IVe-2	52	3x8
JfD	Jefferson cobbly loam, 12 to 20 percent slopes	34	VIe-1	52	3x8
JfE	Jefferson cobbly loam, 20 to 35 percent slopes	34	VIe-1	52	3x8
LaB	Leadvale silt loam, 2 to 5 percent slopes	34	IIe-2	49	3o7
LaC	Leadvale silt loam, 5 to 12 percent slopes	34	IIIe-5	51	3o7
LbD	Leesburg gravelly loam, 10 to 20 percent slopes	35	IVe-2	52	3x8
LeF	Lehew channery loam, 25 to 60 percent slopes	35	VIIe-1	53	4f3
Ln	Lindside silt loam	36	IIw-1	50	2w8
LzD	Litz shaly silt loam, 8 to 20 percent slopes	36	VIe-3	53	3f8
LzE	Litz shaly silt loam, 20 to 35 percent slopes	36	VIe-3	53	3f8
LzE3	Litz shaly silt loam, 20 to 35 percent slopes, severely eroded	36	VIIe-1	53	4c3e
LzF	Litz shaly silt loam, 35 to 60 percent slopes	37	VIIe-1	53	3f8
Ma	Melvin silt loam	37	IIIw-1	51	2w9
MeB	Minvale silt loam, 2 to 5 percent slopes	38	IIe-1	49	3o7
MeC	Minvale silt loam, 5 to 12 percent slopes	38	IIIe-1	50	3o7
MeD	Minvale silt loam, 12 to 20 percent slopes	38	IVe-1	52	3o7
MnD	Montevallo shaly silt loam, 8 to 25 percent slopes	38	VIe-3	53	4d3
MnE	Montevallo shaly silt loam, 25 to 50 percent slopes	39	VIIe-1	53	4d3
MoE	Montevallo-Talbott complex, 20 to 45 percent slopes	39	VIIs-1	53	4d3
NdB	Needmore silt loam, 2 to 5 percent slopes	39	IIIe-4	51	3c2
NdC	Needmore silt loam, 5 to 12 percent slopes	39	IVe-3	52	3c2
NeC	Nella cobbly loam, 5 to 12 percent slopes	40	IVe-2	52	3x8
NeD	Nella cobbly loam, 12 to 20 percent slopes	40	VIe-1	52	3x8
NeE	Nella cobbly loam, 20 to 45 percent slopes	40	VIe-1	52	3x8
RtE	Rock outcrop-Talbott complex, 10 to 40 percent slopes	41	VIIs-1	53	5x3
Sa	Sensabaugh gravelly loam	41	IIs-1	50	2o7
Se	Sequatchie loam	42	I-1	49	2o7
SkC2	Sequoia silt loam, 3 to 12 percent slopes, eroded	42	IVe-3	52	3c2
SkD2	Sequoia silt loam, 12 to 20 percent slopes, eroded	42	VIe-2	53	3c2
Sn	Sewanee loam	42	IIw-1	50	2w8
SoC	Shouns silt loam, 3 to 12 percent slopes	43	IIIe-1	50	3o7
SoD	Shouns silt loam, 12 to 25 percent slopes	43	IVe-1	52	3o7
Ss	Staser silt loam	43	I-1	49	2o7
St	Statler silt loam	44	I-1	49	2o7
Su	Sullivan loam	45	I-1	49	2o7
Ta	Taft silt loam	45	IIIw-2	51	3w8
TbC2	Talbott silt loam, 5 to 12 percent slopes, eroded	46	IVe-3	52	3c2
TbD2	Talbott silt loam, 12 to 25 percent slopes, eroded	46	VIe-2	53	3c2
ToD3	Talbott silty clay, 12 to 25 percent slopes, severely eroded	46	VIe-2	53	4c3e
TrD	Talbott-Rock outcrop complex, 5 to 20 percent slopes	46	VIs-1	53	4x3
TrE	Talbott-Rock outcrop complex, 20 to 50 percent slopes	47	VIIs-1	53	4x3
WaF	Wallen gravelly loam, 25 to 60 percent slopes	47	VIIe-1	53	4f3
WeF	Wallen-Rock outcrop complex, 25 to 60 percent slopes	47	VIIs-1	53	5x3
Ws	Whitesburg silt loam	48	IIw-1	50	2w8
Wt	Whitwell loam	48	IIw-1	50	2w8

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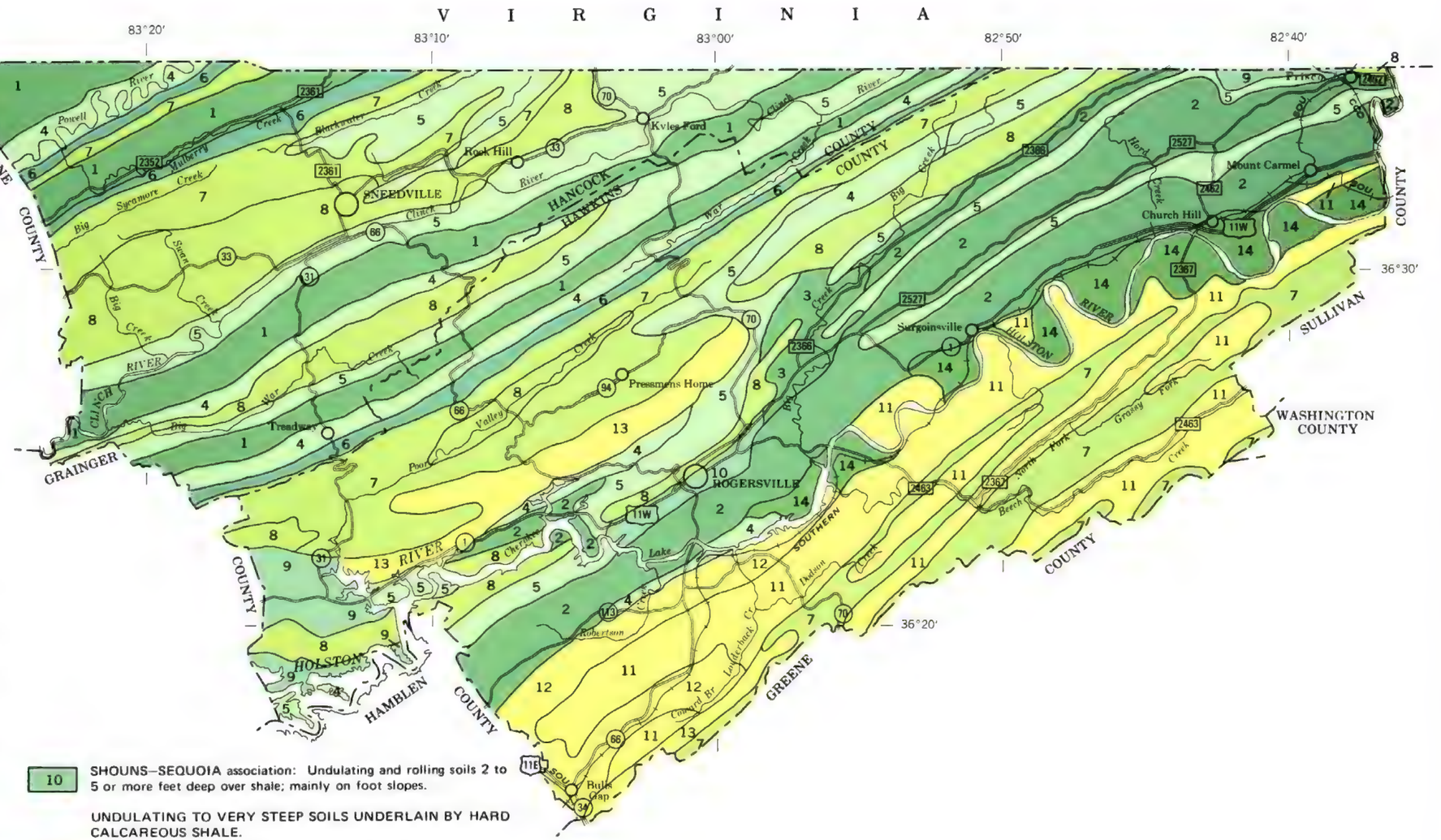


LEGEND

UNDULATING TO STEEP SOILS UNDERLAIN BY DOLOMITIC LIMESTONE.

1 — FULLERTON–CLAIBORNE–CLARKSVILLE association: Hilly and steep, dominantly cherty soils more than 6 feet deep over dolomitic limestone; on high hills and ridges.

2 — DUNMORE–DEWEY association: Rolling and hilly soils more than 6 feet deep over dolomitic limestone; on rounded hills.

3 — DECATUR–DEWEY association: Undulating to hilly soils more than 6 feet deep over dolomitic limestone; on rounded hills.

ROLLING TO STEEP SOILS UNDERLAIN BY INTERMITTENT BANDS OF LIMESTONE AND SOFT SHALE.

4 — TALBOTT–ROCK OUTCROP association: Rolling to steep soils less then 3½ feet deep over limestone, and rock outcrop; in long narrow valleys.

5 — MONTEVALLO–TALBOTT–ROCK OUTCROP association: Hilly and steep soils less than 3½ feet deep over shale or limestone, and limestone outcrops; in long narrow valleys.

HILLY AND STEEP SOILS ON MOUNTAIN BACK SLOPES

6 — HAYTER–LITZ association: Hilly and steep soils 1½ to 6 or more feet deep over shale or limestone; on mountain back slopes.

HILLY TO VERY STEEP SOILS ON MOUNTAINS AND SHALE RIDGES AND FOOT SLOPES.

7 — WALLEN–JEFFERSON association: Hilly to very steep, gravelly soils 1½ to 5 feet or more deep over sandstone and shale; on sandstone mountains and foot slopes.

8 — LEHEW–WALLEN–CALVIN association: Steep and very steep, shaly and gravelly soils 1 to 3 feet deep over shale and sandstone; on high hills and ridges.

UNDULATING TO HILLY SOILS UNDERLAIN BY SOFT SHALE.

9 — SEQUOIA–MONTEVALLO association: Undulating to hilly soils 1 to 3½ feet deep over shale; on uplands.

10 — SHOUNS–SEQUOIA association: Undulating and rolling soils 2 to 5 or more feet deep over shale; mainly on foot slopes.

UNDULATING TO VERY STEEP SOILS UNDERLAIN BY HARD CALCAREOUS SHALE.

11 — DANRIDGE–WHITESBURG association: Steep soils less than 2 feet deep over shale rock and narrow strips of gently sloping soils 4 or more feet deep over shale rock; on hills and in hollows.

12 — DANRIDGE–NEEDMORE–LEADVALE association: Undulating to hilly soils 1½ to 5 feet deep over calcareous shale rock; on uplands and foot slopes.

13 — CYNTHIANA–LITZ association: Steep, flaggy and shaly soils 1 to 3 feet deep over shale and limestone; on hills and ridges.

UNDULATING TO HILLY SOILS ON RIVER TERRACES UNDERLAIN BY SHALE.

14 — HOLSTON–CLOUDLAND–DANDRIDGE association: Undulating and rolling soils 5 to 6 or more feet deep over shale and hilly soils less then 2 feet deep over shale; mainly on river terraces.

Compiled 1977

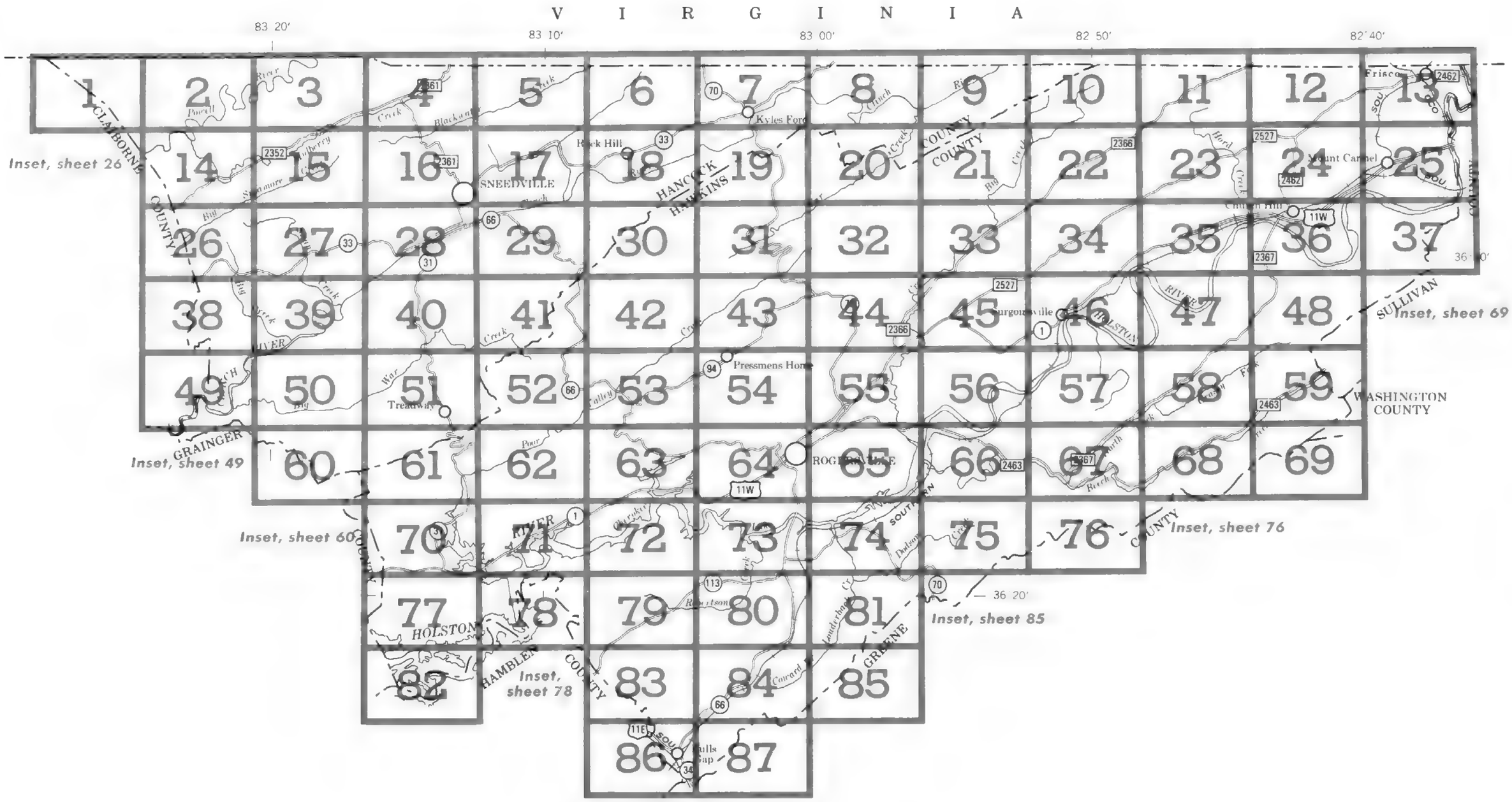
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TENNESSEE AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

HAWKINS AND HANCOCK COUNTIES, TENNESSEE

Scale 1:253,440
1 0 1 2 3 4 Miles



Original text from each map sheet:
"This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned."

N

INDEX TO MAP SHEETS

HAWKINS AND HANCOCK COUNTIES, TENNESSEE

Scale 1:253,440

1 0 1 2 3 4 Miles

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

SOIL LEGEND

The first capital letter is the initial one of the soil name. The second position is used to identify additional mapping units that have the same initial capital letter. This second position is a lower-case letter. The third position, if used, is a capital letter and connotes slope class. Symbols without a slope letter are for level soils. A final number, 2 or 3 in the symbol, shows the soil is eroded

SYMBOL	NAME
AnC	Allen loam, 5 to 12 percent slopes
AnD	Allen loam, 12 to 20 percent slopes
AnE	Allen loam, 20 to 35 percent slopes
At	Altavista silt loam
BdE	Bland-Rock outcrop complex, 20 to 40 percent slopes
BoF	Bouldin cobbly loam, 20 to 60 percent slopes
CaE	Calvin silt loam, 15 to 35 percent slopes
CaF	Calvin silt loam, 35 to 60 percent slopes
CcF	Calvin-Wallen complex, 25 to 60 percent slopes
CeC	Claiborne silt loam, 5 to 12 percent slopes
CeD	Claiborne silt loam, 12 to 25 percent slopes
CeE	Claiborne silt loam, 25 to 40 percent slopes
CfE3	Claiborne soils, 15 to 35 percent slopes, severely eroded
CkD	Clarksville cherty silt loam, 5 to 20 percent slopes
CkE	Clarksville cherty silt loam, 20 to 40 percent slopes
CoB	Cloudland loam, 2 to 5 percent slopes
CoC	Cloudland loam, 5 to 12 percent slopes
CyD	Cynthiana flaggy silty clay loam, 5 to 20 percent slopes
CyE	Cynthiana flaggy silty clay loam, 20 to 50 percent slopes
DaD	Dandridge shaly silty clay loam, 5 to 20 percent slopes
DaE	Dandridge shaly silty clay loam, 20 to 35 percent slopes
DaF	Dandridge shaly silty clay loam, 35 to 60 percent slopes
DcD	Decatur silt loam, 5 to 12 percent slopes Decatur silt loam, 12 to 20 percent slopes
DeC	Dewey silt loam, 5 to 12 percent slopes
DeD	Dewey silt loam, 12 to 20 percent slopes
DnC	Dunmore silt loam, 5 to 12 percent slopes
DnD	Dunmore silt loam, 12 to 20 percent slopes
DnE	Dunmore silt loam, 20 to 35 percent slopes
DoD	Dunmore silty clay loam, 12 to 25 percent slopes
Du	Dunning silty clay loam
Ea	Ealy loam
Em	Emory silt loam
EtB	Etowah silt loam, 2 to 5 percent slopes
EtC	Etowah silt loam, 5 to 12 percent slopes
EtD	Etowah silt loam, 12 to 25 percent slopes
FnC	Fullerton cherty silt loam, 5 to 12 percent slopes
FnD	Fullerton cherty silt loam, 12 to 20 percent slopes
FnE	Fullerton cherty silt loam, 20 to 35 percent slopes
GpF	Gilpin silt loam, 25 to 50 percent slopes
Gr	Greendale silt loam
Gu	Guthrie silt loam
Ha	Hamblen silt loam
HeC	Hartsells loam, 3 to 12 percent slopes
HeD	Hartsells loam, 12 to 20 percent slopes
HhC	Hayter loam, 3 to 12 percent slopes
HhD	Hayter loam, 12 to 20 percent slopes
HhE	Hayter loam, 20 to 35 percent slopes
HkD	Hayter cobbly loam, 10 to 20 percent slopes
HkE	Hayter cobbly loam, 20 to 35 percent slopes
HkF	Hayter cobbly loam, 35 to 55 percent slopes
HoB	Holston loam, 2 to 5 percent slopes
HoC	Holston loam, 5 to 12 percent slopes
HoD	Holston loam, 12 to 20 percent slopes
Hx	Holston-Urban land complex
JeC	Jefferson loam, 5 to 12 percent slopes
JeD	Jefferson loam, 12 to 20 percent slopes
JfC	Jefferson cobbly loam, 5 to 12 percent slopes
JfD	Jefferson cobbly loam, 12 to 20 percent slopes
JfE	Jefferson cobbly loam, 20 to 35 percent slopes
LaB	Leadvale silt loam, 2 to 5 percent slopes
LaC	Leadvale silt loam, 5 to 12 percent slopes
LbD	Leesburg gravelly loam, 10 to 20 percent slopes
LeF	Lehew channery loam, 25 to 60 percent slopes
Ln	Lindside silt loam
LzD	Litz shaly silt loam, 8 to 20 percent slopes
LzE	Litz shaly silt loam, 20 to 35 percent slopes
LzE3	Litz shaly silt loam, 20 to 35 percent slopes, severely eroded
LzF	Litz shaly silt loam, 35 to 60 percent slopes
Ma	Melvin silt loam
MeB	Minvale silt loam, 2 to 5 percent slopes
MeC	Minvale silt loam, 5 to 12 percent slopes
MeD	Minvale silt loam, 12 to 20 percent slopes
MnD	Montevallo shaly silt loam, 8 to 25 percent slopes
MnE	Montevallo shaly silt loam, 25 to 50 percent slopes
MoE	Montevallo-Talbott complex, 20 to 45 percent slopes
NdB	Needmore silt loam, 2 to 5 percent slopes
NdC	Needmore silt loam, 5 to 12 percent slopes
NeC	Nella cobbly loam, 5 to 12 percent slopes
NeD	Nella cobbly loam, 12 to 20 percent slopes
NeE	Nella cobbly loam, 20 to 45 percent slopes
RtE	Rock outcrop-Talbott complex, 10 to 40 percent slopes
Sa	Sensabaugh gravelly loam
Se	Sequatchie loam
SkC2	Sequoia silt loam, 3 to 12 percent slopes, eroded
SkD2	Sequoia silt loam, 12 to 20 percent slopes, eroded
Sn	Sewanee loam
SoC	Shouns silt loam, 3 to 12 percent slopes
SoD	Shouns silt loam, 12 to 25 percent slopes
Ss	Staser silt loam
St	Statler silt loam
Su	Sullivan loam
Ta	Taft silt loam
TbC2	Talbott silt loam, 5 to 12 percent slopes, eroded
TbD2	Talbott silt loam, 12 to 25 percent slopes, eroded
ToD3	Talbott silty clay, 12 to 25 percent slopes, severely eroded
TrD	Talbott-Rock outcrop complex, 5 to 20 percent slopes
TrE	Talbott-Rock outcrop complex, 20 to 50 percent slopes
WaF	Wallen gravelly loam, 25 to 60 percent slopes
WeF	Wallen-Rock outcrop complex, 25 to 60 percent slopes
Ws	Whitesburg silt loam
Wt	Whitwell loam

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (75)
- Federal (416)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water)
- Intermittent (dry)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (CeA, FoB2)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

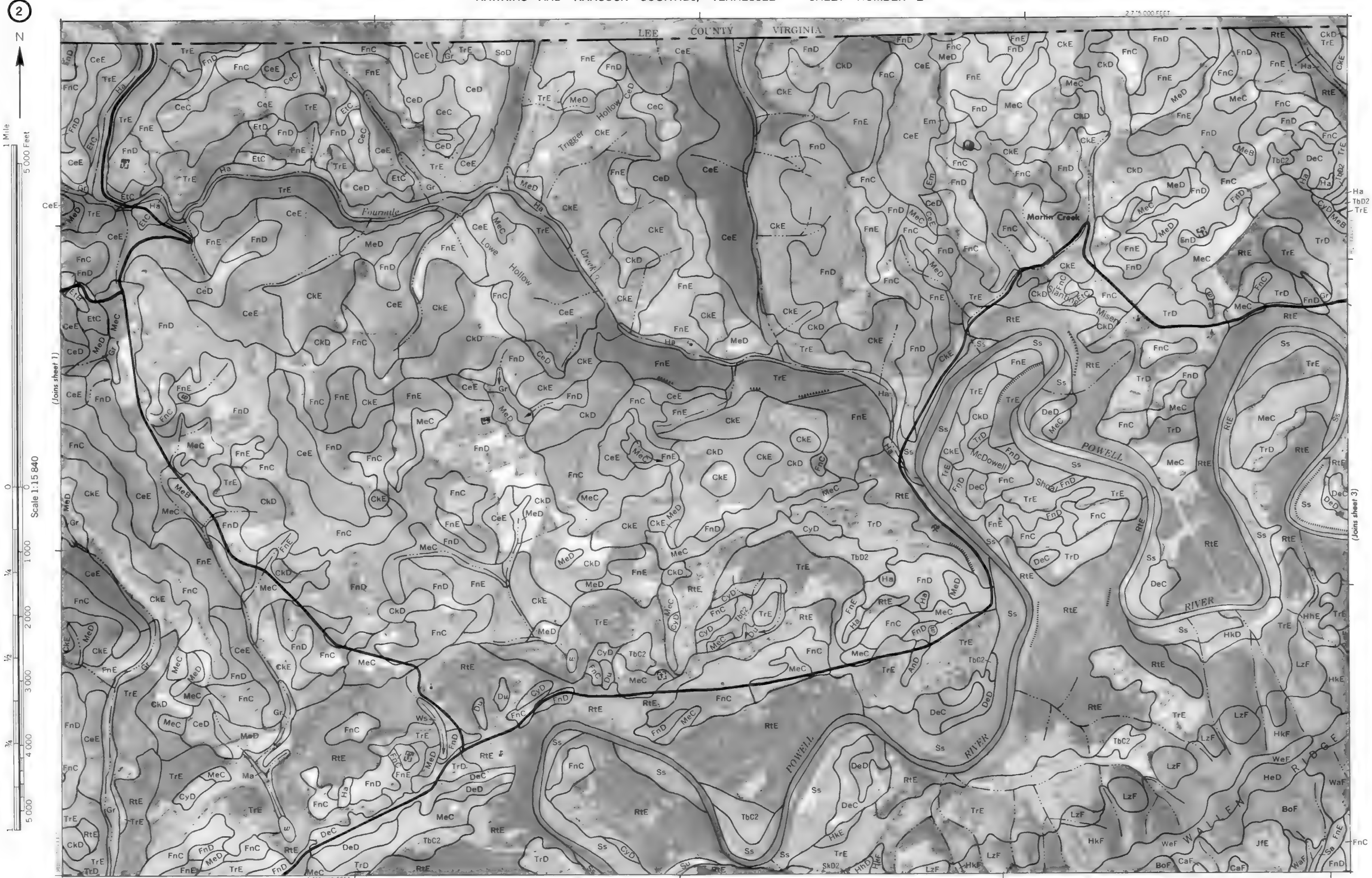
DEPRESSION OR SINK

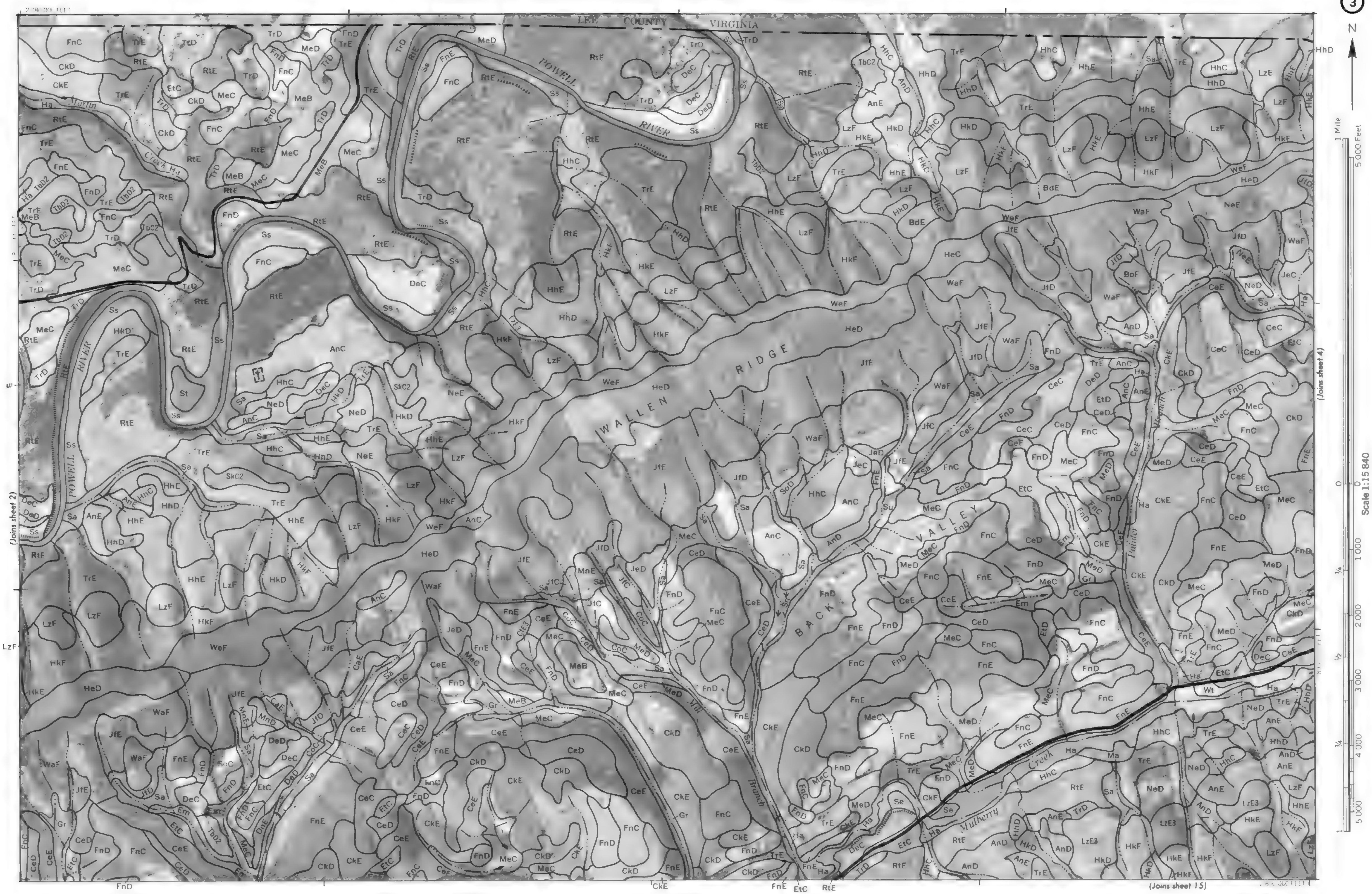
SOIL SAMPLE SITE (normally not shown)

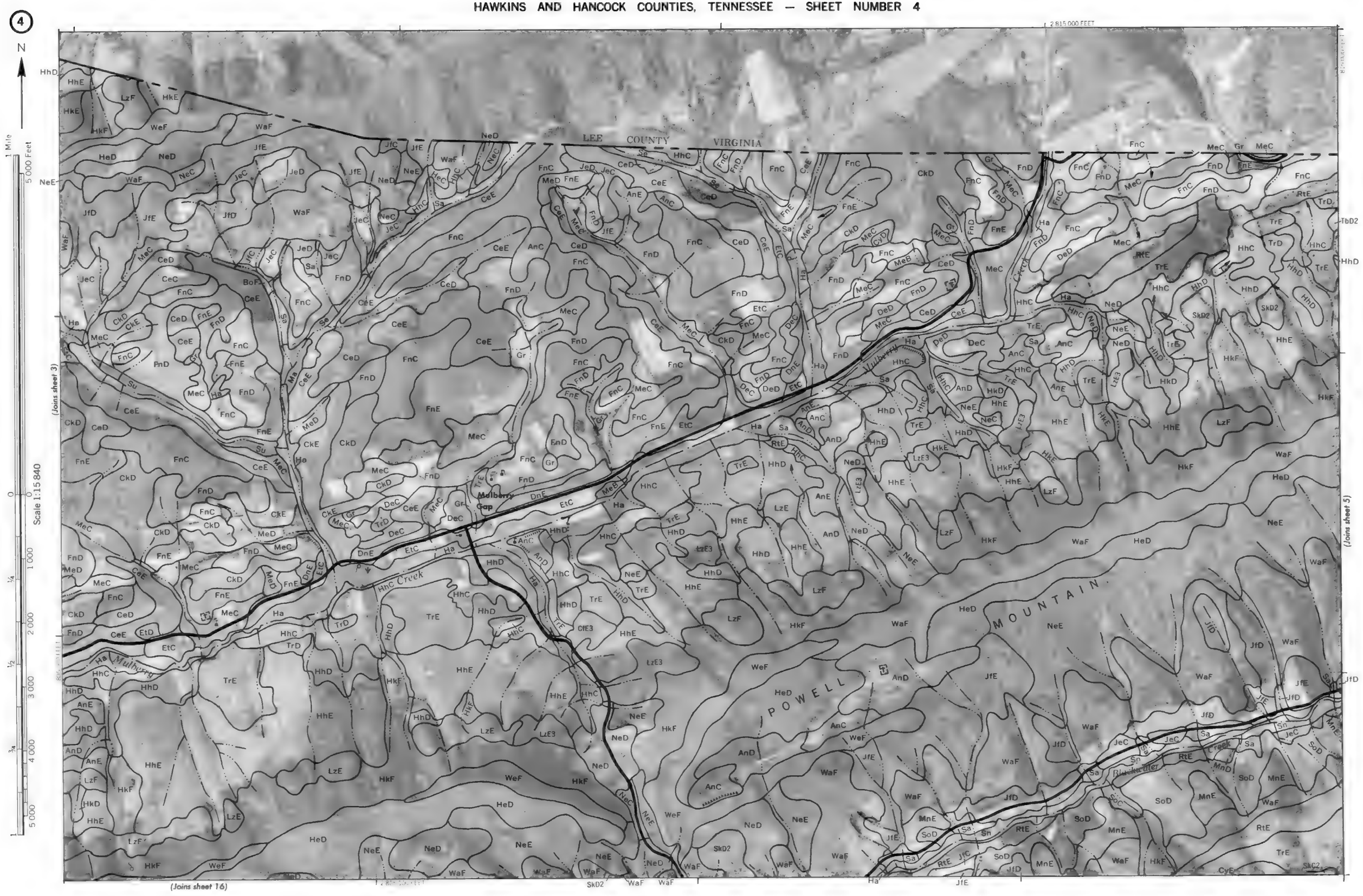
MISCELLANEOUS

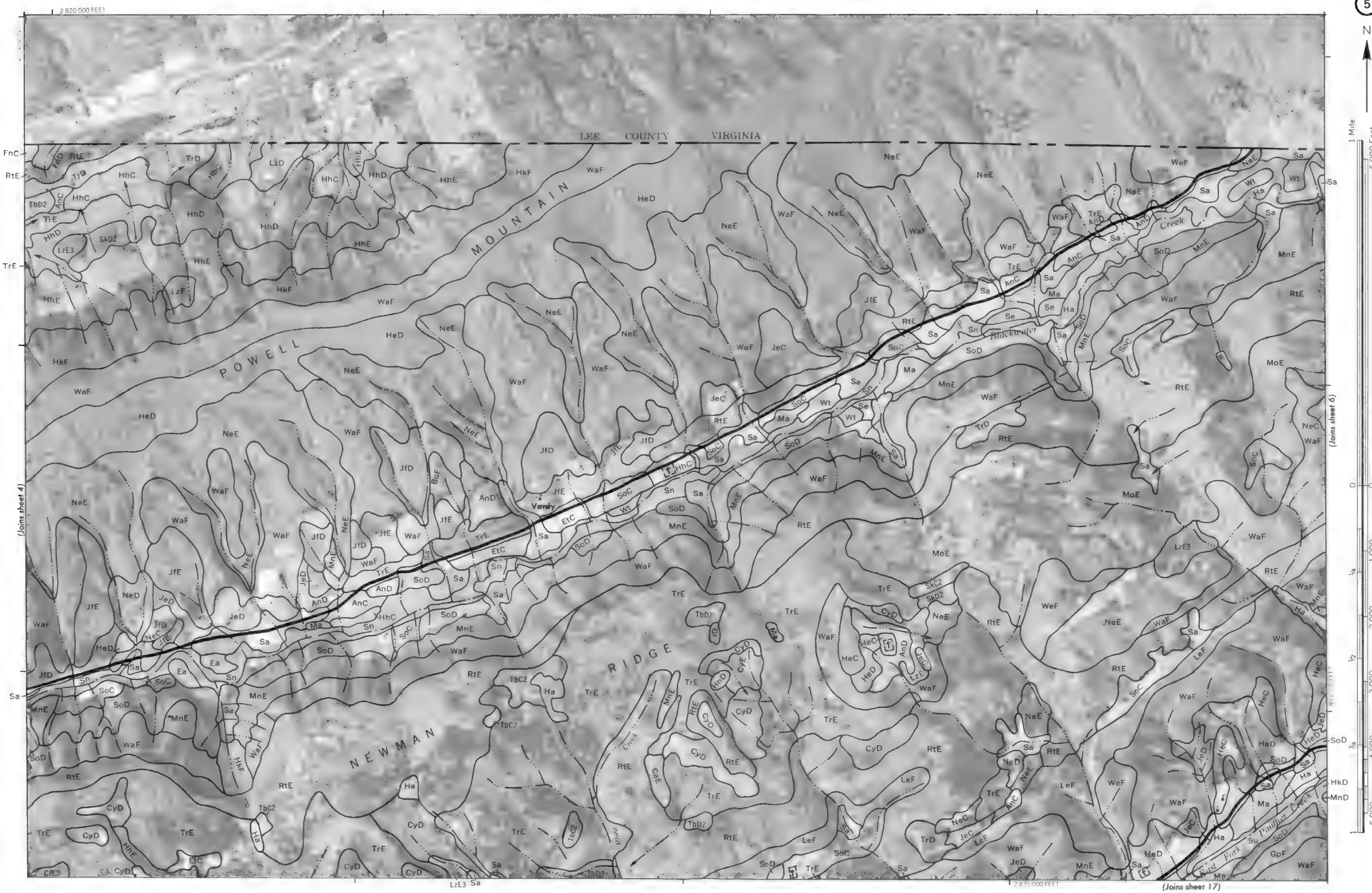
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot


1
N
LEE COUNTY VIRGINIA
CLAIBORNE COUNTY
Branch
Sutton
Montgomery Hollow
(Joins sheet 2)
(Joins inset, sheet 26)
2 745 000 FEET
2 760 000 FEET
810 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840


2
N
LEE COUNTY VIRGINIA
Trigger Hollow
Fourmile
Lowe Hollow
Creek
Martin Creek
Misery
McDowell Shoal
POWELL RIVER
POWELL RIVER
WALLEN RIDGE
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 14)
Scale 1:15 840
1 Mile
5 000 Feet
1 000
2 000
3 000
4 000
5 000
¼
½
¾
0


3
N
LEE COUNTY
VIRGINIA
POWELL RIVER
POWELL RIVER
Martin Creek
WALLEN RIDGE
BACK VALLEY
Mill Branch
Panther Branch
Mulberry Creek
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 15)
Scale 1:15 840
1 Mile
5 000 Feet

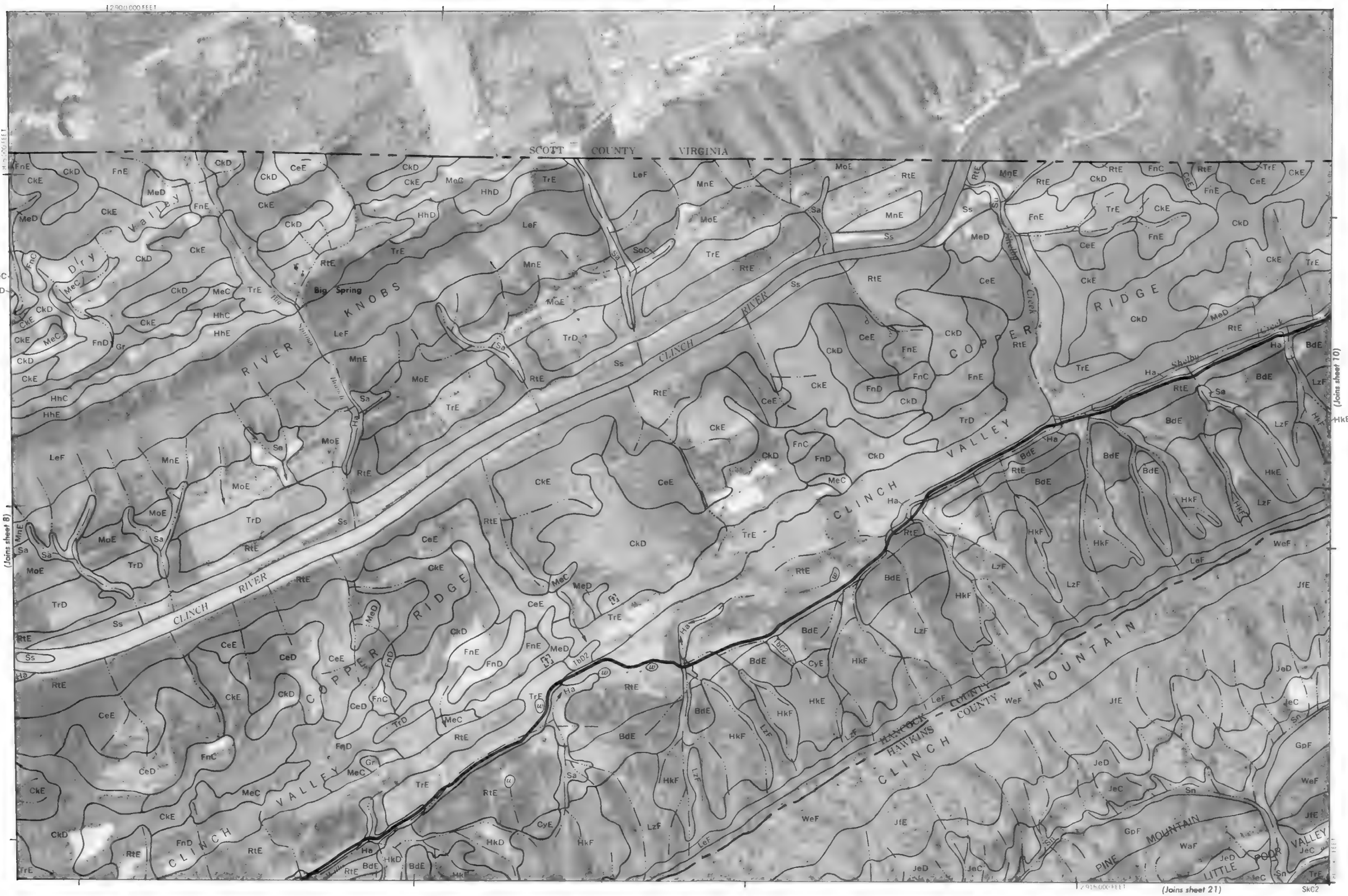

4
N
2 815 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
LEE COUNTY
VIRGINIA
Mulberry Gap
HhC Creek
Blackwater Creek
POWELL MOUNTAIN
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 16)
TbD2
HhD
JfD


5
N
LEE COUNTY VIRGINIA
POWELL MOUNTAIN
NEWMAN RIDGE
Blackwater Creek
Vardy
East Fork Panther Creek
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 17)
2 820 000 FEET
2 835 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840


6
N
1 Mile
5 000 Feet
Scale 1:15 840
LEE COUNTY VIRGINIA
NEWMAN RIDGE
INDIAN RIDGE
Fox Branch
East Fork Panther Creek
Blackwater Creek
Native Branch
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 18)
2 840 000 FEET
33


2 860 000 FEET
LEE COUNTY VIRGINIA
Kyles Ford
CLINCH RIVER
RIDGE
BIG
(Joins sheet 6)
(Joins sheet 8)
(Joins sheet 19)
2 875 000 FEET
7
N
1 Mile
5 000 Feet
Scale 1:15 840


8
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000
LEE COUNTY VIRGINIA
SCOTT COUNTY VIRGINIA
CLINCH RIVER
NORTH FORK
NORTH Fisher Valley
KNOBS
BIG RIDGE
Dry Valley
Pumpkin Valley
Brumley Valley
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 20)
Independence
2 895 000 FEET
805 000 FEET
2 880 000 FEET



9

N

1 Mile

5 000 Feet

Scale 1:15 840

0 0

¼ 1 000

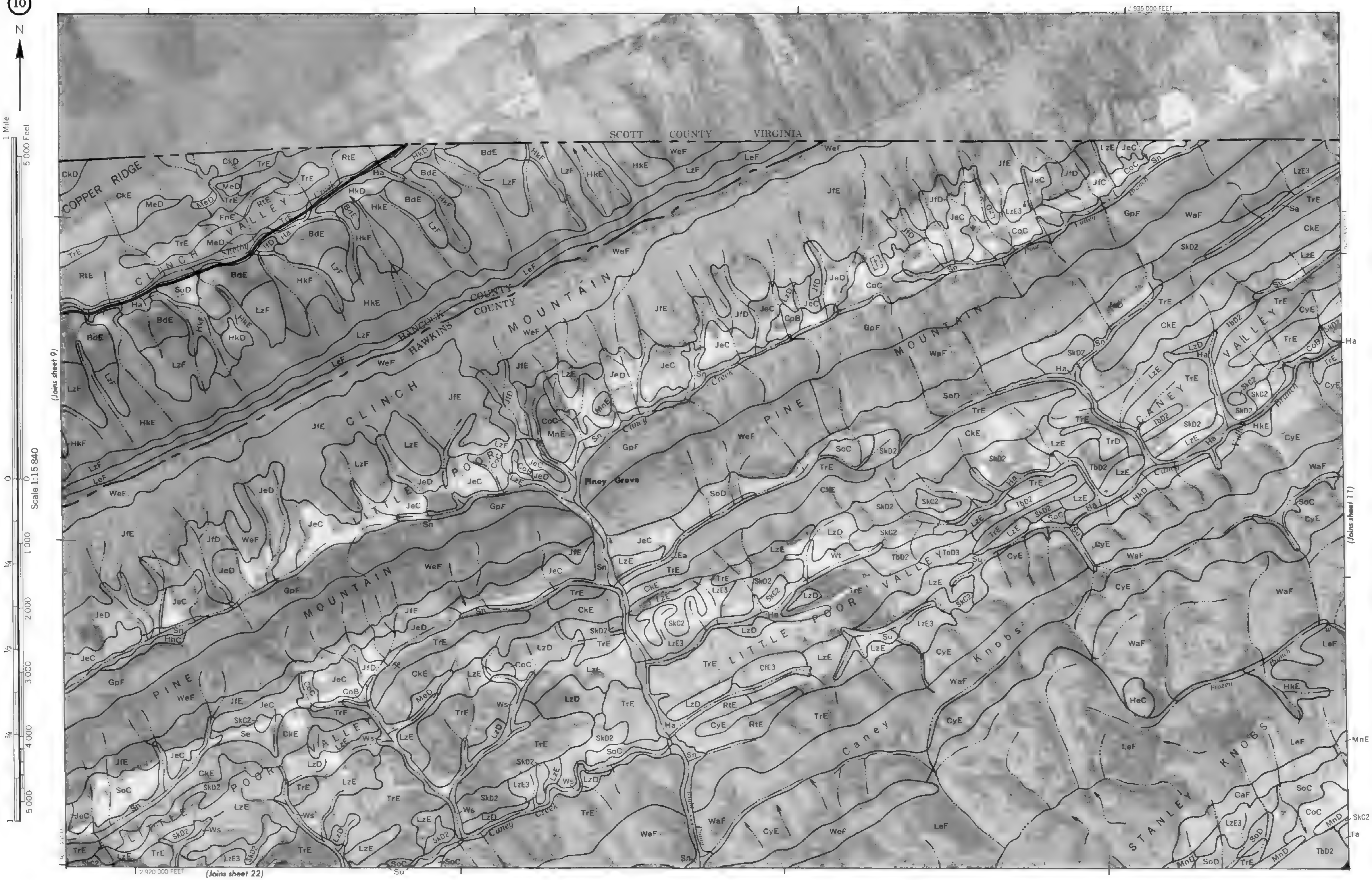
½ 2 000

¾ 3 000

1 4 000

5 000

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 10



2 940 000 FEET

SCOTT COUNTY VIRGINIA

CANEY VALLEY

Caney Knobs

Caney Valley Creek

Possum Knobs

Possum Creek

Poor Valley Branch

Possum Trot Creek

Gravelly Ridge

Okolona

STANLEY VALLEY

Stanley Knobs

Possum Hratch Creek

N

1 Mile

5 000 Feet

Scale 1:15 840

0 1 000 2 000 3 000 4 000 5 000

810 000 FEET

2 955 000 FEET

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 23)

12

N

2 975 000 FEET

SCOTT COUNTY VIRGINIA

STANLEY VALLEY

CARTER VALLEY

Ridge

Gravelly Ridge

Sensabaugh Branch

Loyd Ridge

(Joins sheet 11)

(Joins sheet 13)

(Joins sheet 24)

1 Mile

5 000 Feet

Scale 1:15 840

0 1 000 2 000 3 000 4 000 5 000


2980 000 FEET
SCOTT COUNTY VIRGINIA
STANLEY VALLEY
CARTER VALLEY
CLAIBORNE VALLEY
Frisco
SOUTHERN
Marshall
Sensabaugh Branch
Newsbaugh Branch
Robins Branch
HOLSTON RIVER
CLINCHFIELD
SULLIVAN COUNTY
Rotherwood Heights
2 995 000 FEET
(Joins sheet 12)
(Joins sheet 25)
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000

14

N

(Joins sheet 2)

(Joins inset, sheet 26)

(Joins sheet 15)

(Joins sheet 26)

2 780 000 FEET

Scale 1:15 840

1 Mile 5 000 Feet

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

POWELL RIVER

Parkey Gap

Mulberry Creek

Little Mulberry Creek

Sulphur Hollow

WALLEN RIDGE

Little Ridge

POWELL MOUNTAIN

Snake Hollow

CLAIBORNE COUNTY

N

1 Mile 5 000 Feet

Scale 1:15 840

(Joins sheet 3)

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 27)

2 800 000 FEET

Little Ridge

POWELL MOUNTAIN

NEWMAN RIDGE

Snake Ridge

SHORT MOUNTAIN

Sunnyside

Stinking Creek

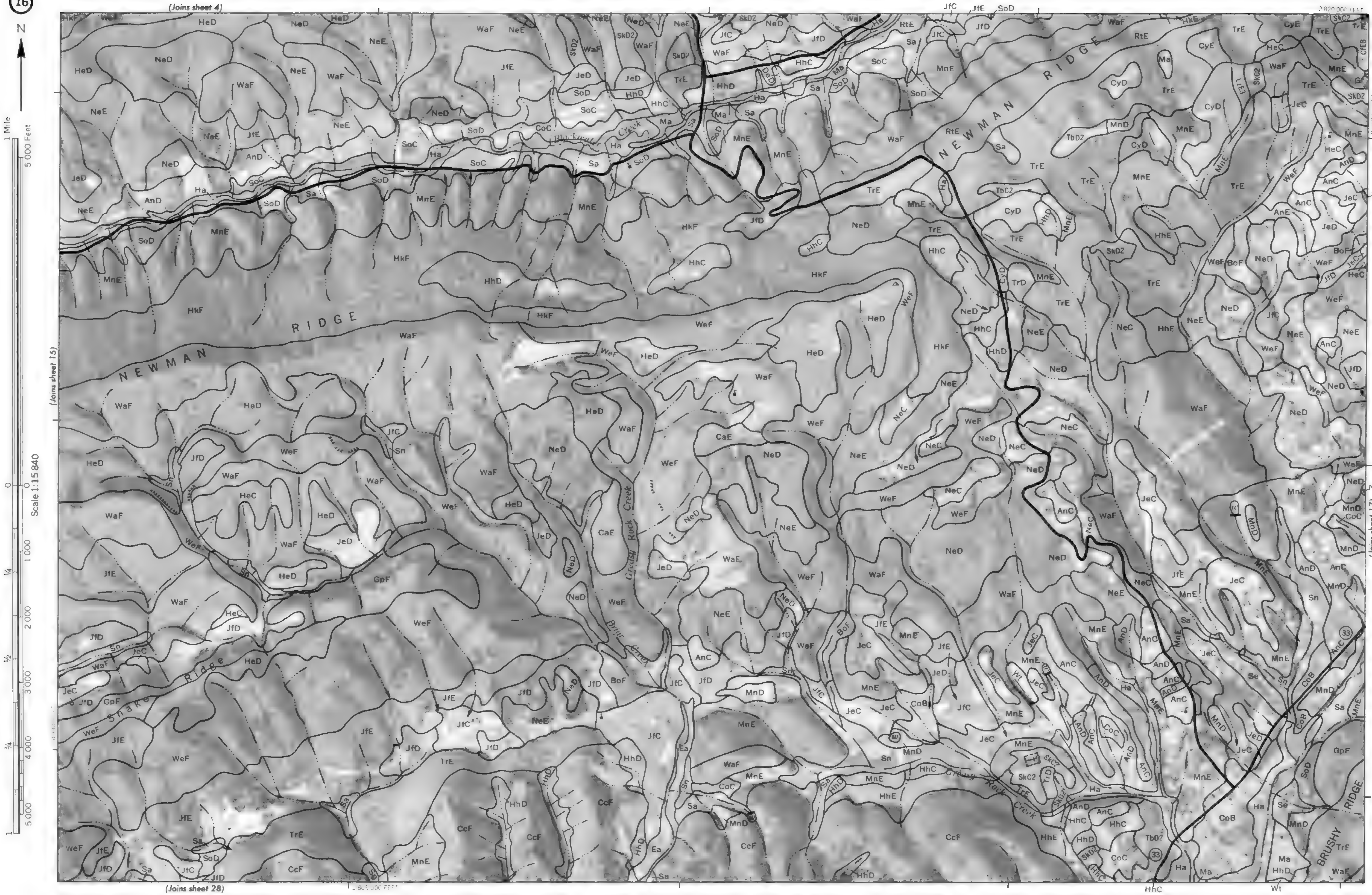
Turkey Creek

Ha Creek

Blackwater Creek

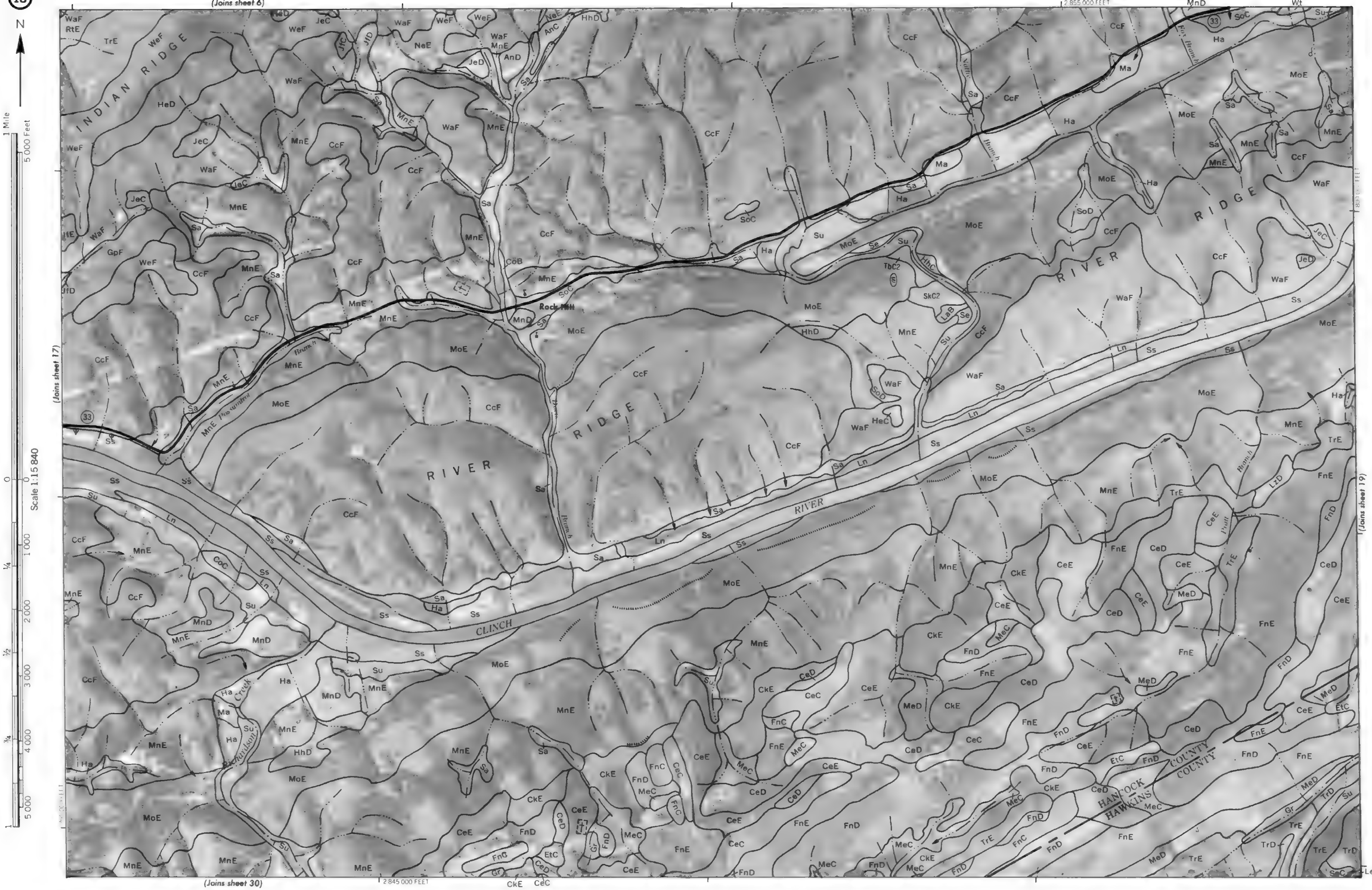
Big Sycamore Creek

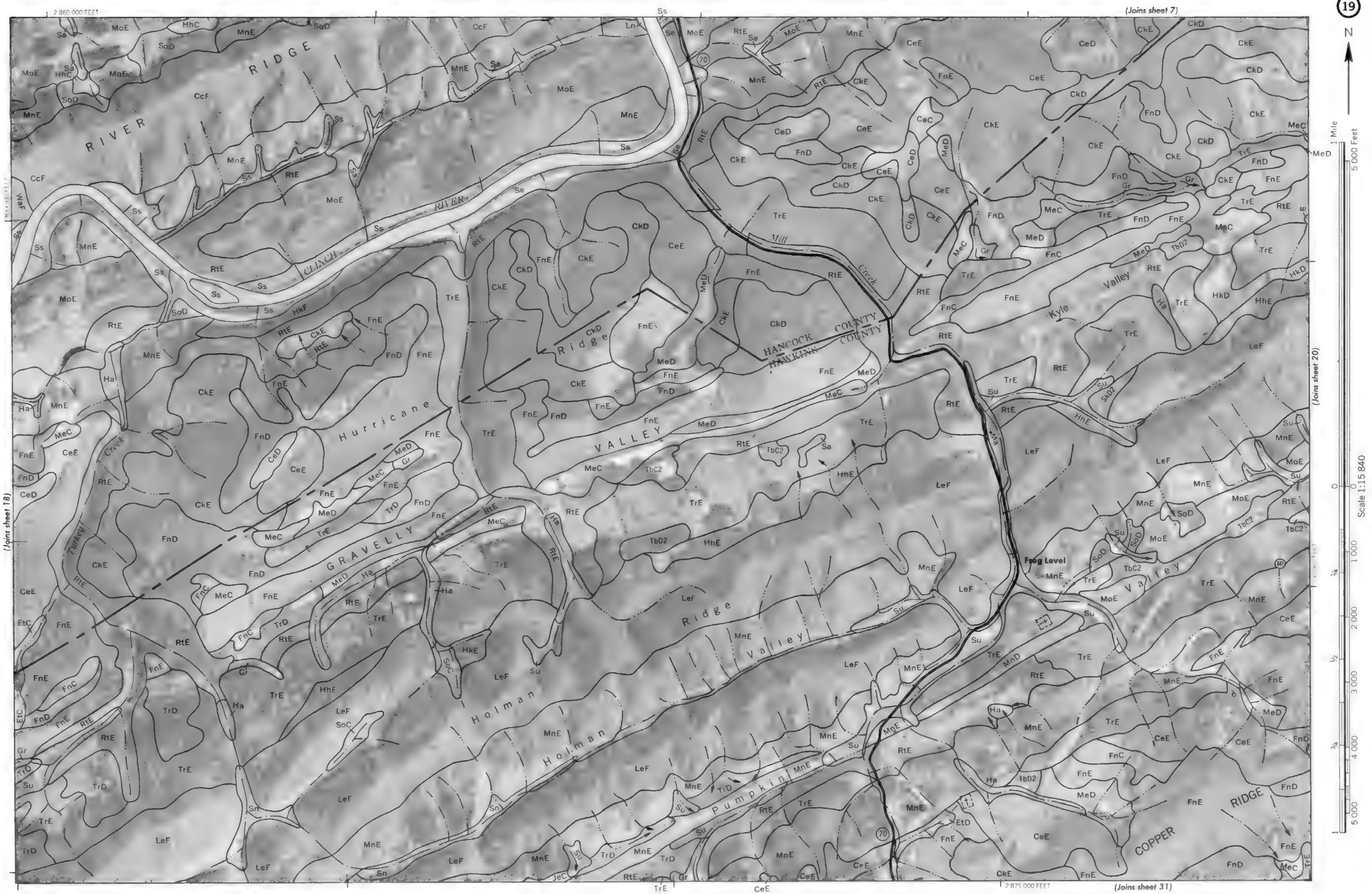
HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 16

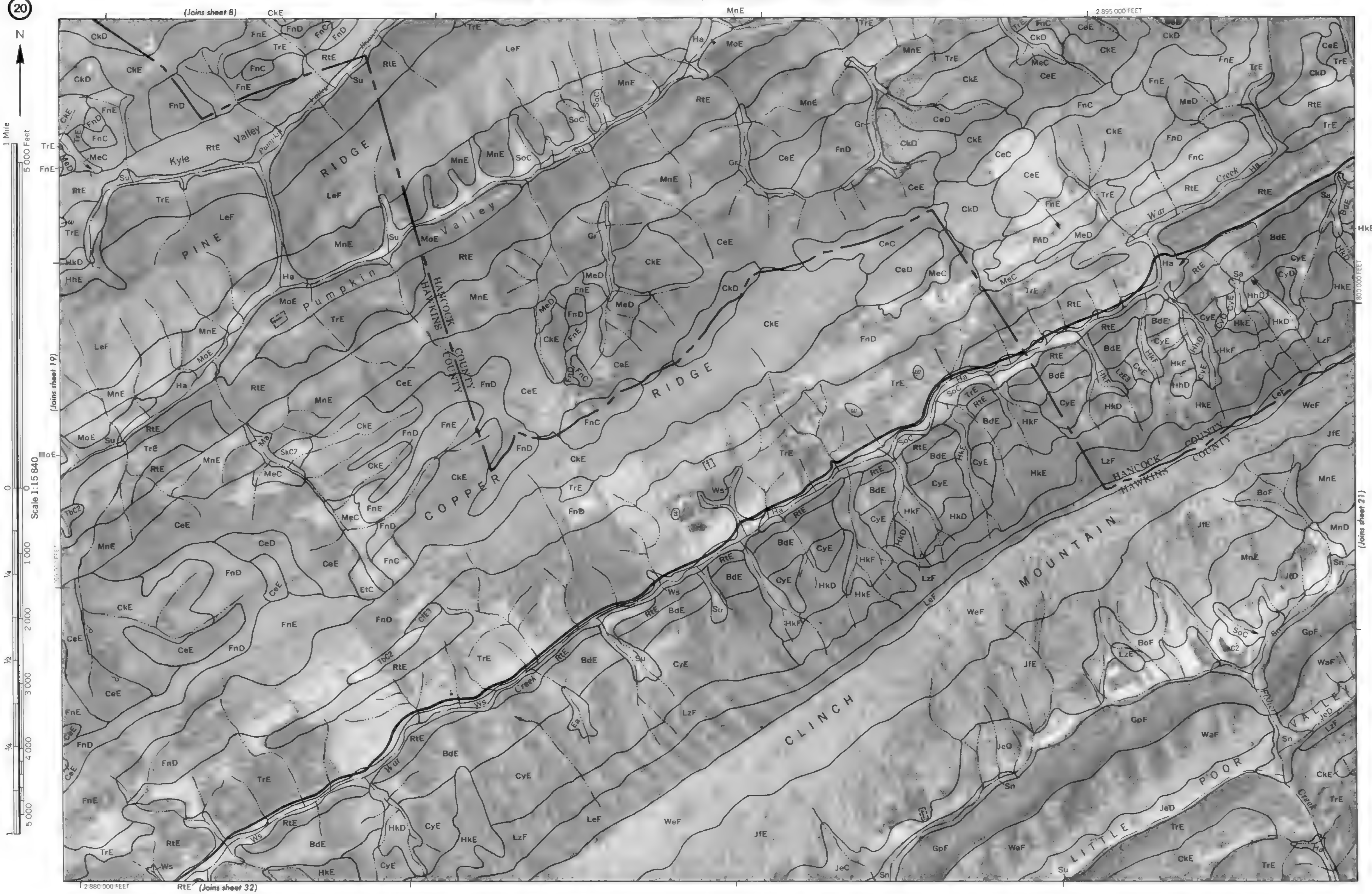


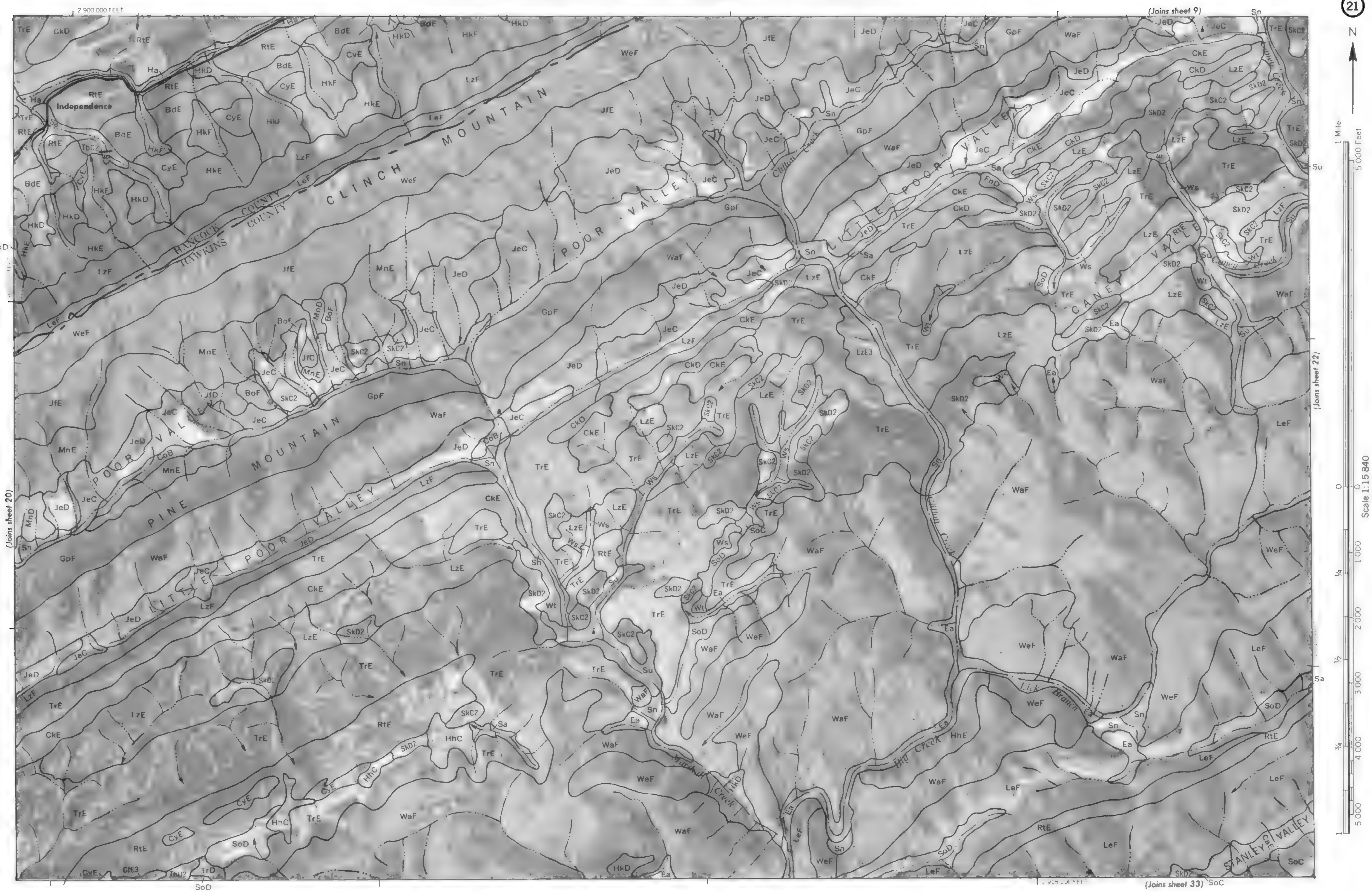
N
(Joins sheet 5)
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 29)
NEWMAN RIDGE
INDIAN RIDGE
BRUSHY RIDGE
Sneedville
(county seat)
West Fork Panther Creek
East Fork Panther Creek
Panther Creek
Panther Creek
Blind Branch
Farmers Branch
CLINCH RIVER
33
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 18

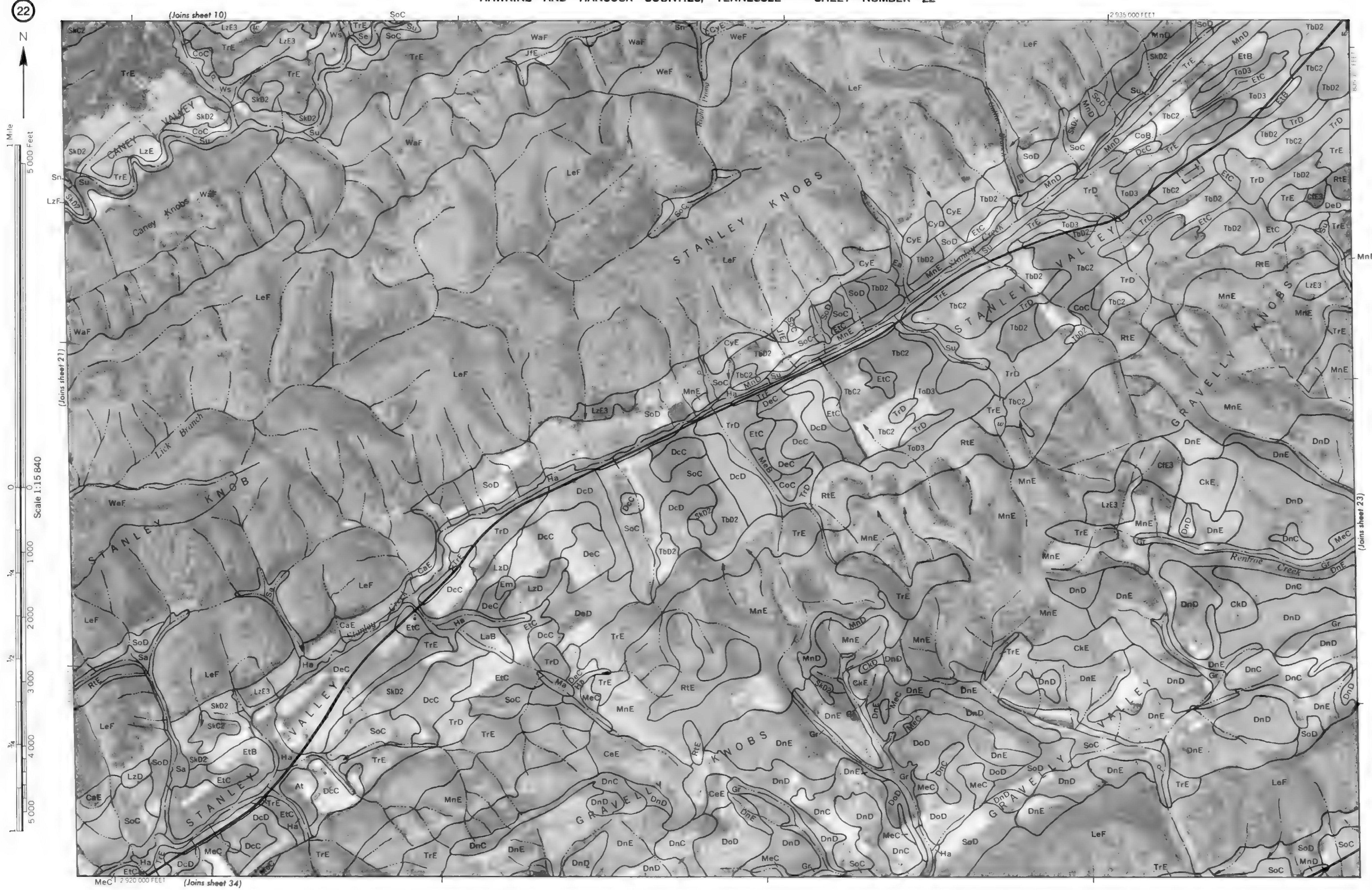



19
N
2 860 000 FEET
2 875 000 FEET
(Joins sheet 7)
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 31)
RIVER RIDGE
CLINCH RIVER
Mill Creek
Turkey Creek
Hurricane Ridge
VALLEY
GRAVELLY
Kyle Valley
HANCOCK COUNTY
HAWKINS COUNTY
Holman Ridge
Holman Valley
Pumpkin Valley
Frog Level
COPPER RIDGE
70
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾
1


20
N
(Joins sheet 8)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 32)
2 895 000 FEET
800 000 FEET
2 880 000 FEET
Kyle Valley
Pumpkin Valley
PINE RIDGE
COPPER RIDGE
CLINCH MOUNTAIN
LITTLE POOR VALLEY
War Creek
HANCOCK COUNTY
HAWKINS COUNTY
Scale 1:15 840
1 Mile
5 000 Feet
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000


21
N
2 900 000 FEET
(Joins sheet 9)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 33)
Independence
HANCOCK COUNTY
HAWKINS COUNTY
CLINCH MOUNTAIN
POOR VALLEY
PINE MOUNTAIN
LITTLE POOR VALLEY
CANEY VALLEY
STANLEY VALLEY
Clifton Creek
Caney Creek
Lick Branch
Big Creek
Marshall Creek
1 Mile
5 000 Feet
Scale 1:15 840

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 22



HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 23

23

N

(Joins sheet 11)

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 35)

VALLEY

RIDGE

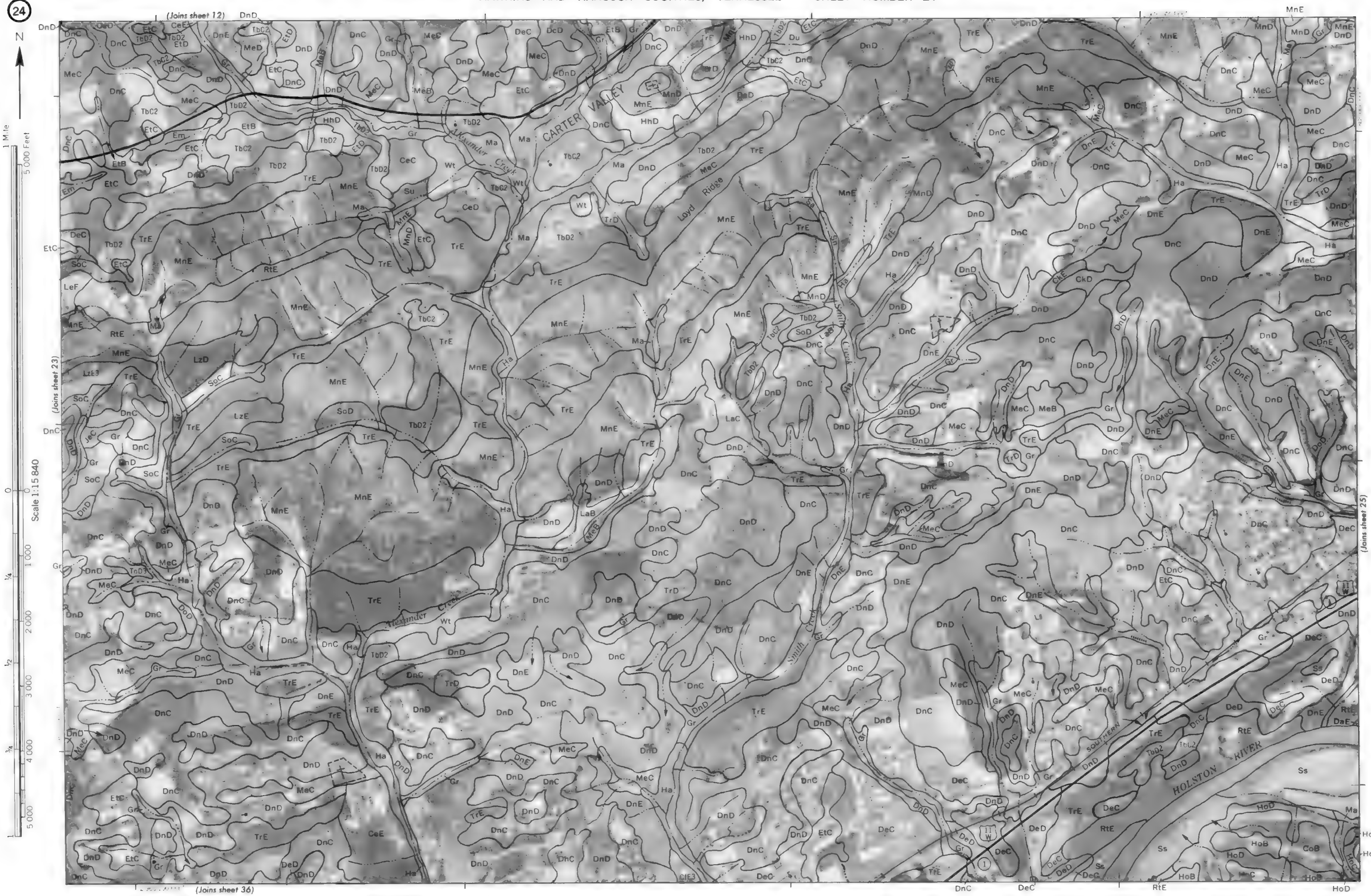
CARTER

Valley View

Scale 1:15 840

1 Mile

5 000 Feet


24
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 12)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 36)
CARTER VALLEY
Loyd Ridge
Alexander Creek
Smith Creek
SOUTHERN
HOLSTON RIVER

N

2 980 000 FEET

905 000 FEET

MOUNT CARMEL

SOUTHERN

Rocky Hill

Arnott Branch

Arnott Branch

HOLSTON ORDNANCE WORKS

HOLSTON RIVER

SULLIVAN COUNTY

CUNCHFIELD

(Joins sheet 13)

(Joins sheet 24)

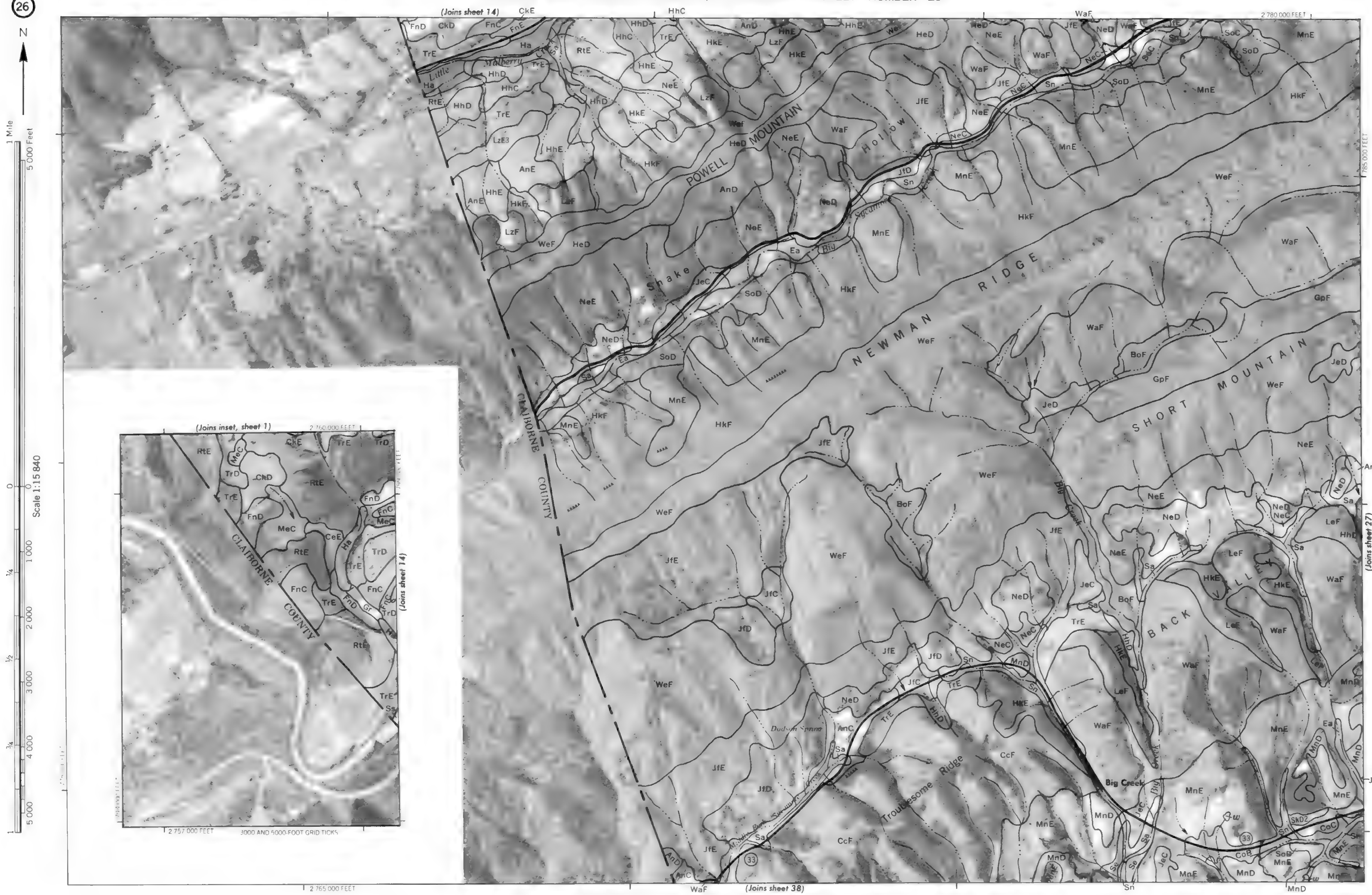
(Joins sheet 37)

1 Mile

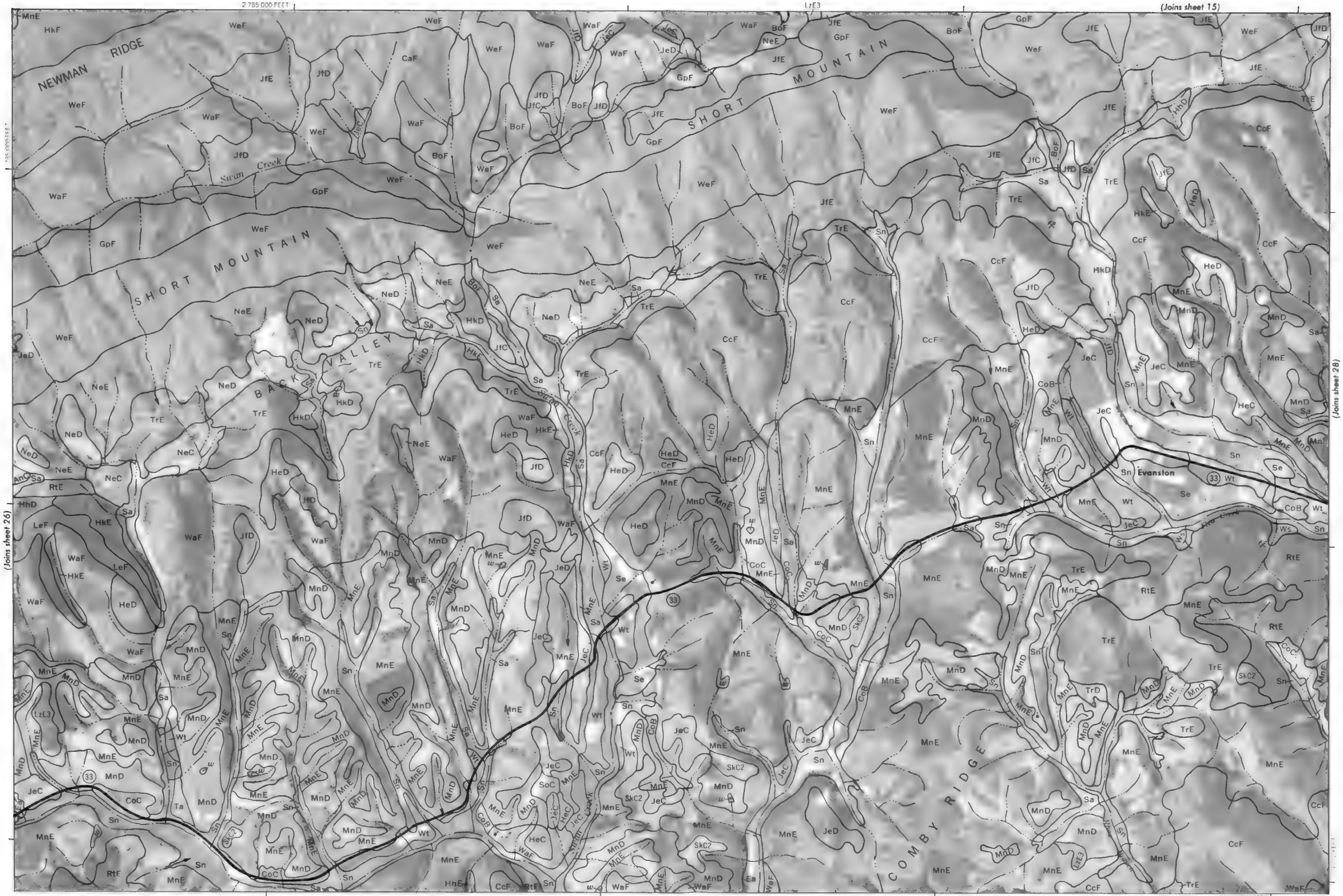
5 000 Feet

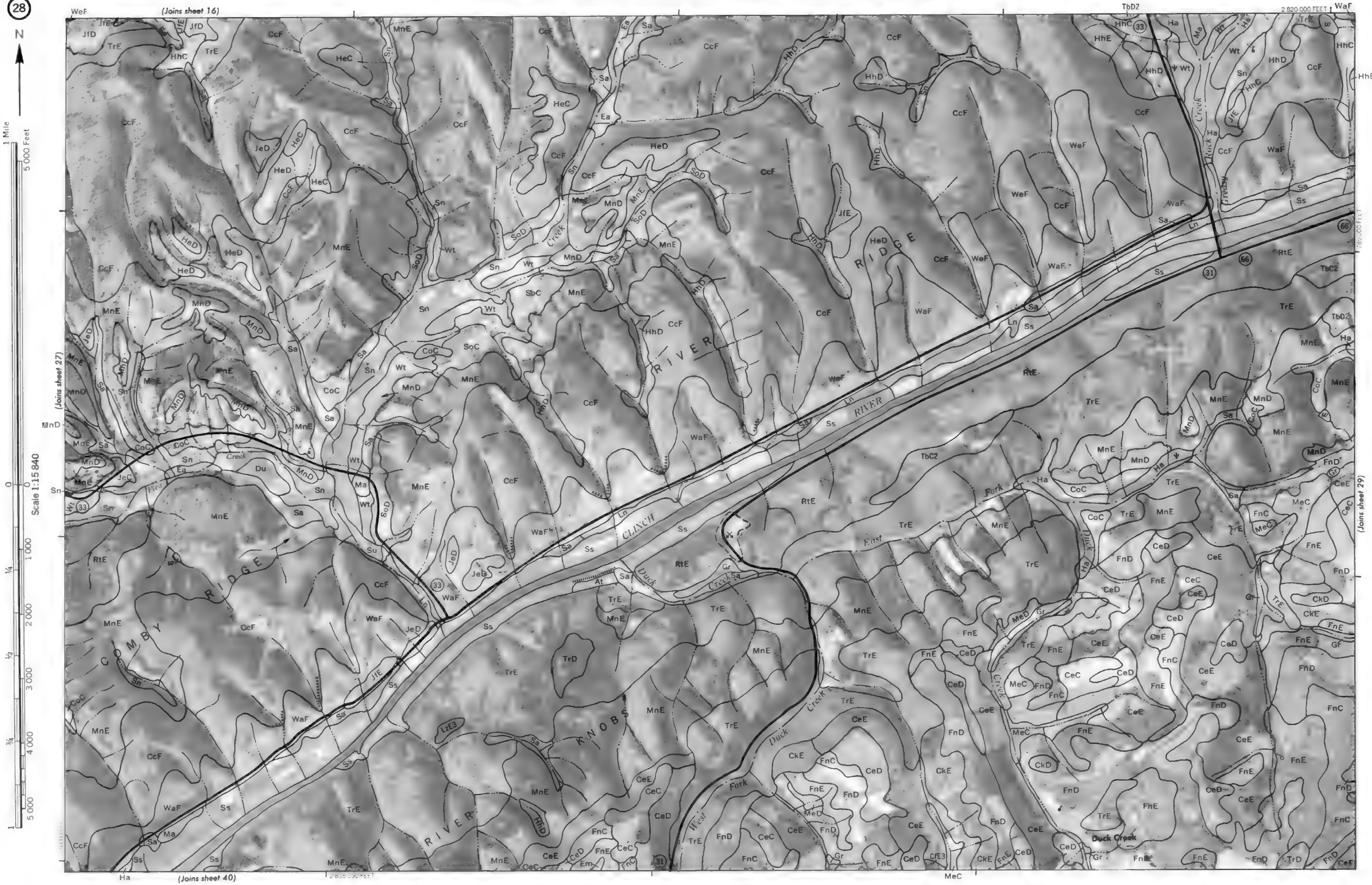
Scale 1:15 840

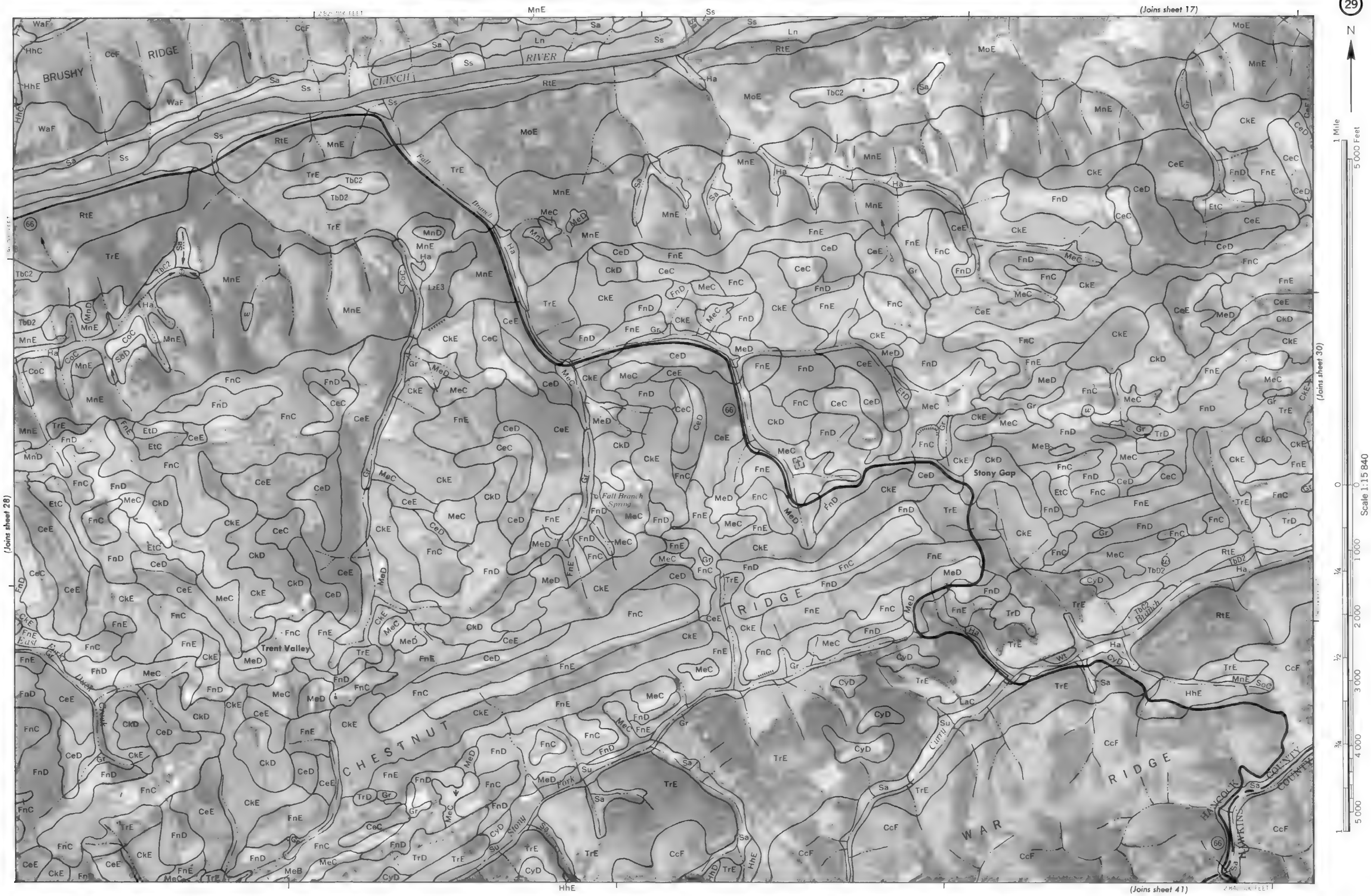
HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 26



HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 27



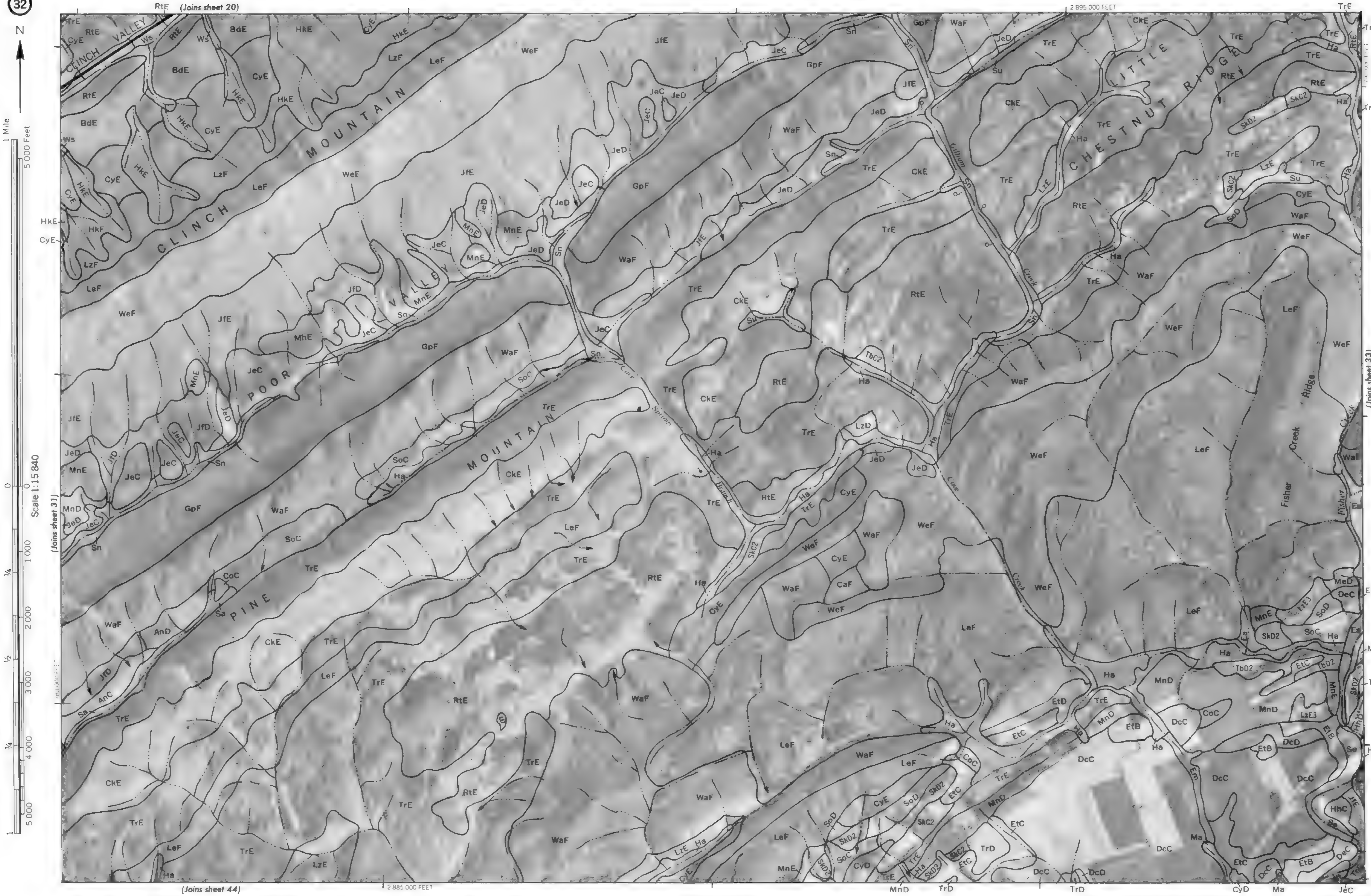

28
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 16)
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 40)
2 820 000 FEET
COMBY RIDGE
CLINCH RIVER
RIVER RIDGE
KNOBS
Duck Creek
East Fork
West Fork
Rock Creek
Greasy Creek


29
N
(Joins sheet 17)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 41)
BRUSHY RIDGE
CLINCH RIVER
Fall Branch
Fall Branch Spring
Stony Gap
Trent Valley
CHESTNUT RIDGE
WAR RIDGE
Stony Fork
Curry
East Fork
Big Branch
HANCOCK COUNTY
HAWKINS COUNTY
66
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000


30
N
(Joins sheet 18)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 42)
2 855 000 FEET
2 845 000 FEET
785 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000
CHESTNUT RIDGE
RIDGE
HANCOCK COUNTY
HAWKINS COUNTY
Richardson
Sweet Creek
Curry Branch
Creek
WAR RIDGE
PINE RIDGE
Valley
Pumpkin
Burd Creek
COPPER RIDGE
CLINCH VALLEY


(Joins sheet 19)
(Joins sheet 30)
(Joins sheet 32)
(Joins sheet 43)
2 860 000 FEET
2 880 000 FEET
780 000 FEET
PINE RIDGE
Turkey Creek
Pumpkin Valley
COPPER RIDGE
CLINCH VALLEY
Eidson
War Creek
CLINCH MOUNTAIN
POOR VALLEY
PINE MOUNTAIN
LITTLE POOR VALLEY
Poor Valley Creek
Valley Creek
N
1 Mile
5 000 Feet
Scale 1:15 840

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 32



(Joins sheet 21)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 45)

N

1 Mile

5 000 Feet

Scale 1:15 840

0 0 ¼ 1 000 ½ 2 000 ¾ 3 000 4 000 5 000

CANEY VALLEY

STANLEY KNOBS

VALLEY

GRAVELLY VALLEY

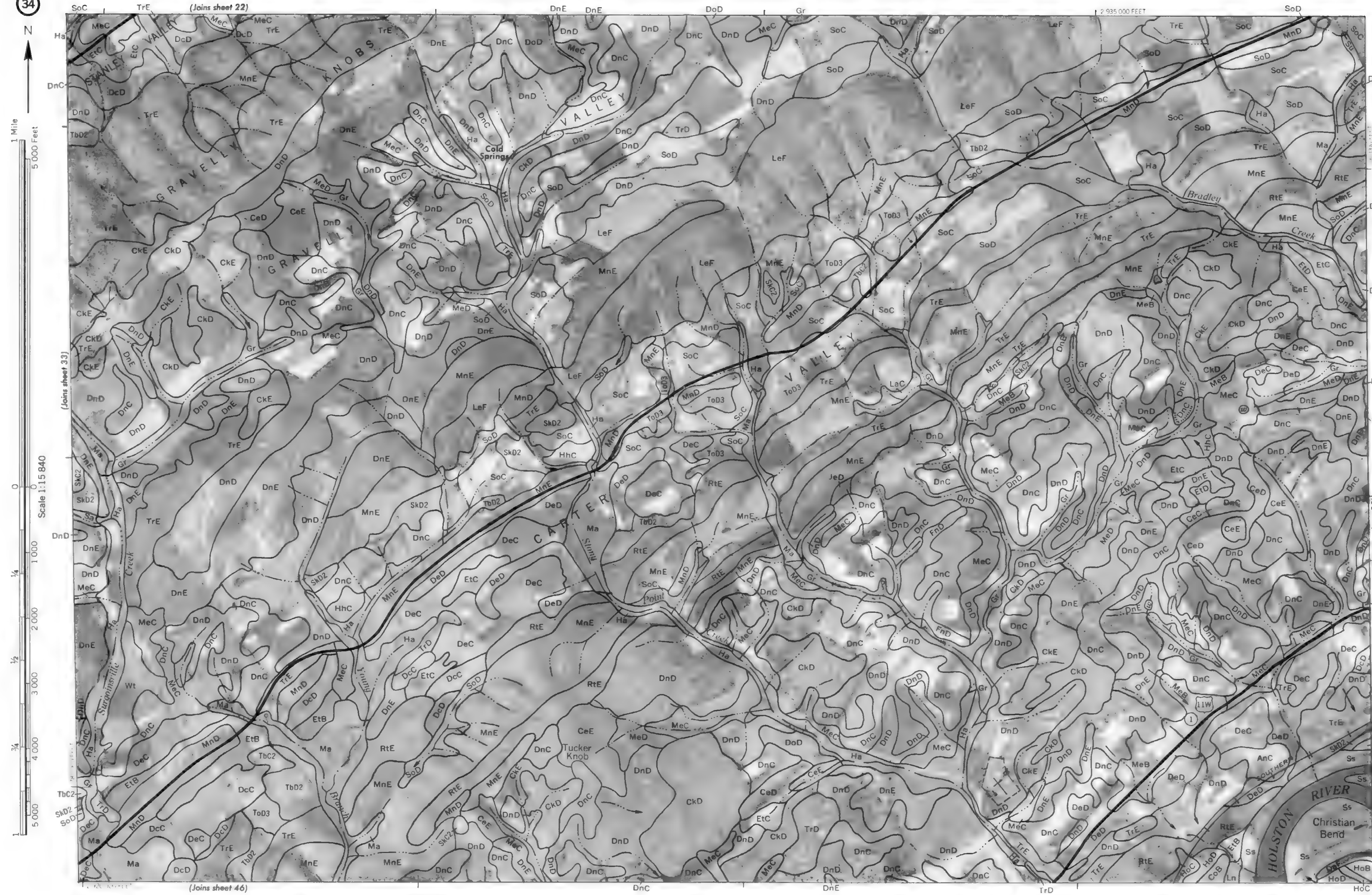
CARTER VALLEY

Big Creek

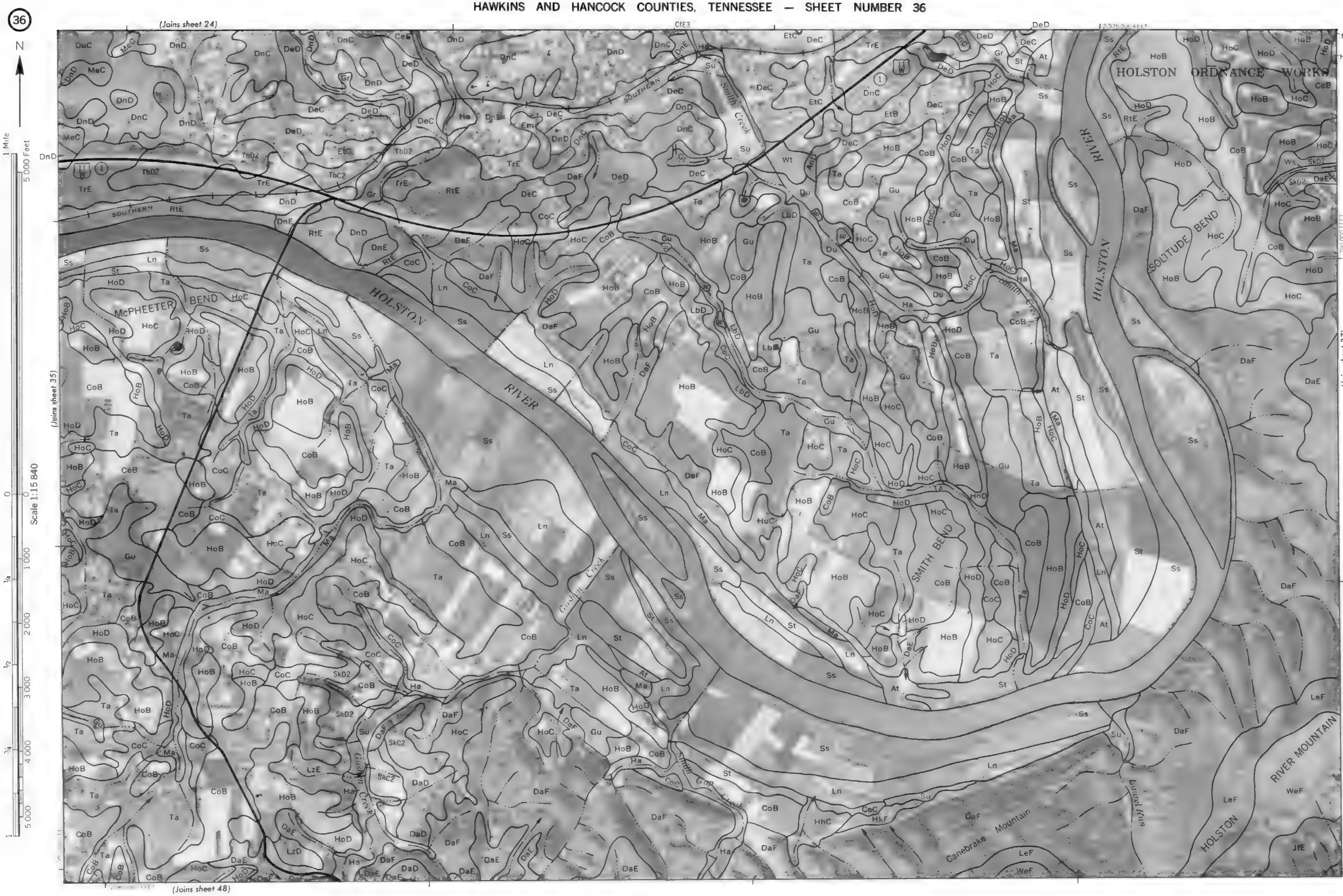
Stanley Creek

Fisher Creek

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 34



HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 35


36
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 24)
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 48)
HOLSTON RIVER
HOLSTON ORDNANCE WORKS
McPHEETER BEND
SMITH BEND
SOLITUDE BEND
RIVER MOUNTAIN
Canebrake Mountain
Smith Creek
Goshen Creek
Smith Gap Creek
Laurel Run
SOUTHERN

(Joins sheet 25)

(Joins sheet 36)

(Joins inset, sheet 69)

HOLSTON RIVER

HOLSTON ORDNANCE WORKS

Ma Arnold Branch

Parker Creek

SULLIVAN COUNTY

HOLSTON RIVER MOUNTAIN

Laurel Run Cliffs

Cherry Knobs

Pretty Ridge

2 980 000 FEET

2 995 000 FEET

785 000 FEET

N

1 Mile

5 000 Feet

Scale 1:15 840

38

N

1 Mile

5,000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

N

1 Mile

5 000 Feet

Scale 1:15 840

2 785 000 FEET

(Joins sheet 27)

(Joins sheet 38)

(Joins sheet 40)

(Joins sheet 50)

2 800 000 FEET

2 765 000 FEET

RIDGE

COMBY

CANEY VALLEY

RIVER KNOBS

CHESTNUT RIDGE

CANTWELL VALLEY

Swan Creek

Clinch River

Yellow Branch

Blu Creek

Lawson Bend


40
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 28)
(Joins sheet 39)
(Joins sheet 41)
(Joins sheet 51)
2 805 000 FEET
CLINCH RIVER
RIVER
KNOBS
Yellow Branch
CHESTNUT RIDGE
Stand Fork
WAR RIDGE
Big War Creek
Coal Branch
Luther
CANTWELL VALLEY
Riley Creek
PINE RIDGE
31
FnE
FnD
FnC
CeD
CeE
CkE
CkD
MeC
MeD
TrE
CcF

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 41

41

N

1 Mile

5 000 Feet

Scale 1:15 840

(Joins sheet 29)

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 52)

2 825 000 FEET

2 840 000 FEET

WAR RIDGE

PINE RIDGE

COPPER RIDGE

CLINCH VALLEY

HANCOCK COUNTY

HAWKINS COUNTY

Coal Branch

Richardson Branch

War Creek

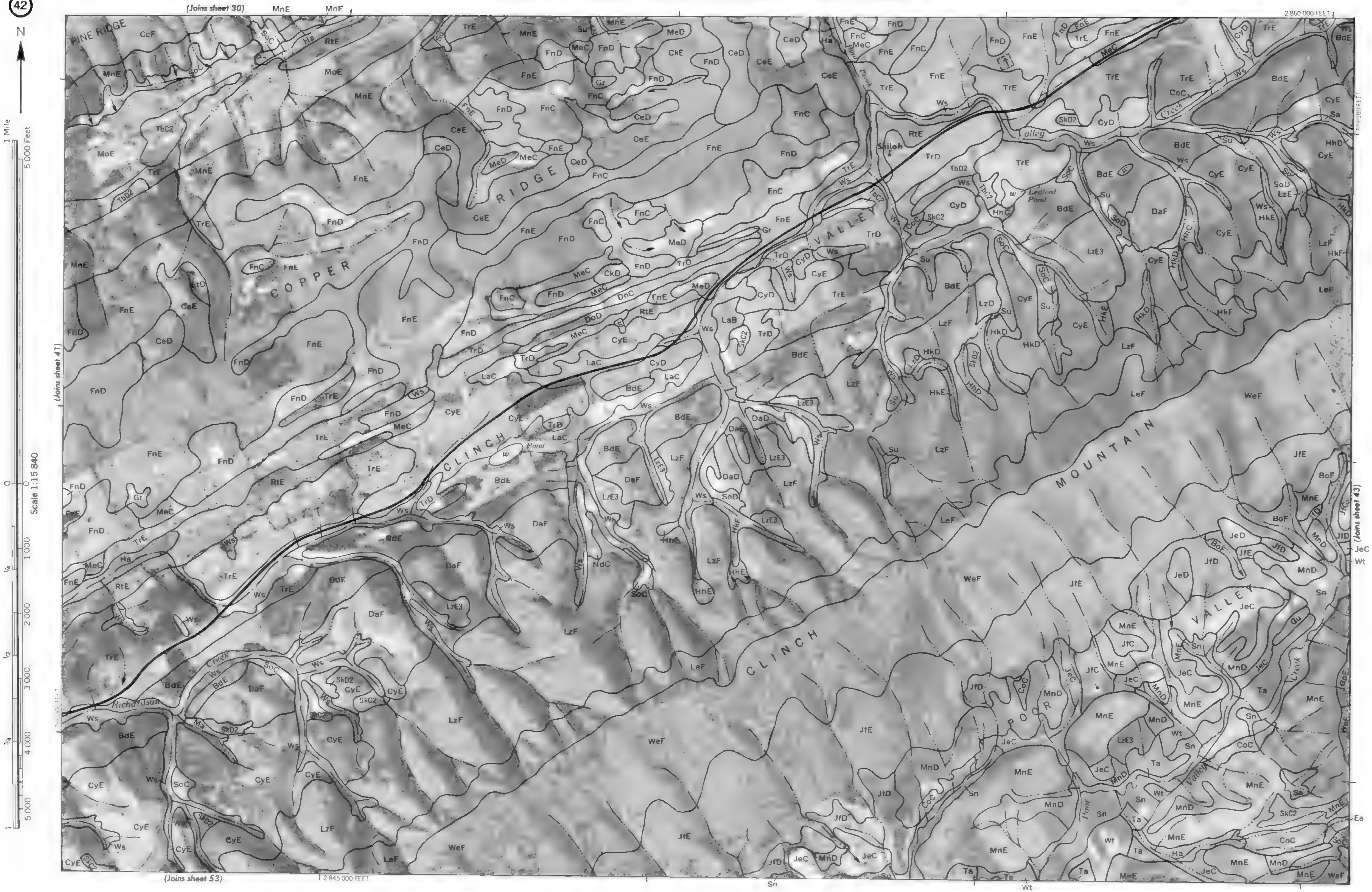
Big Creek

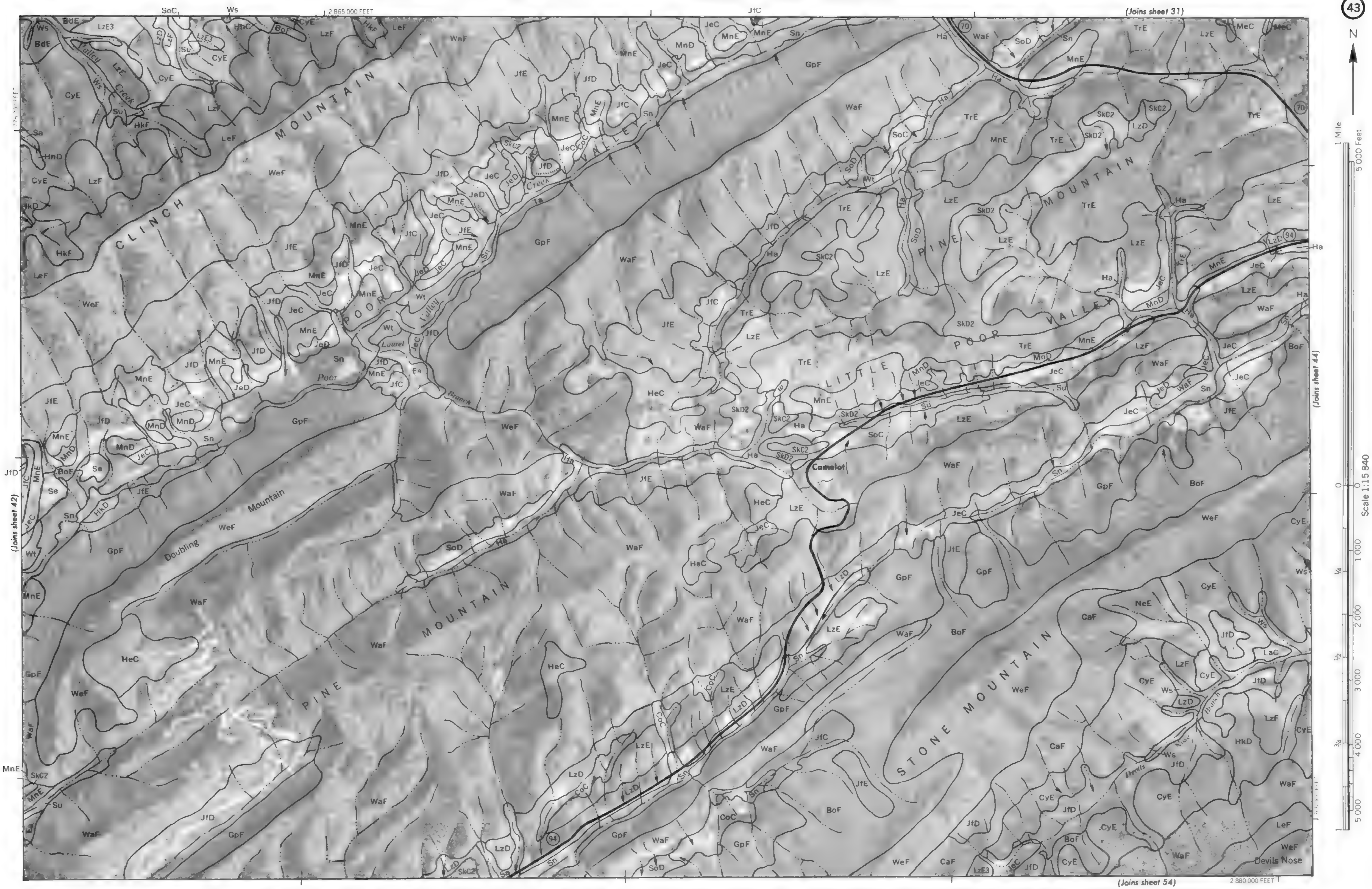
Curtis Creek

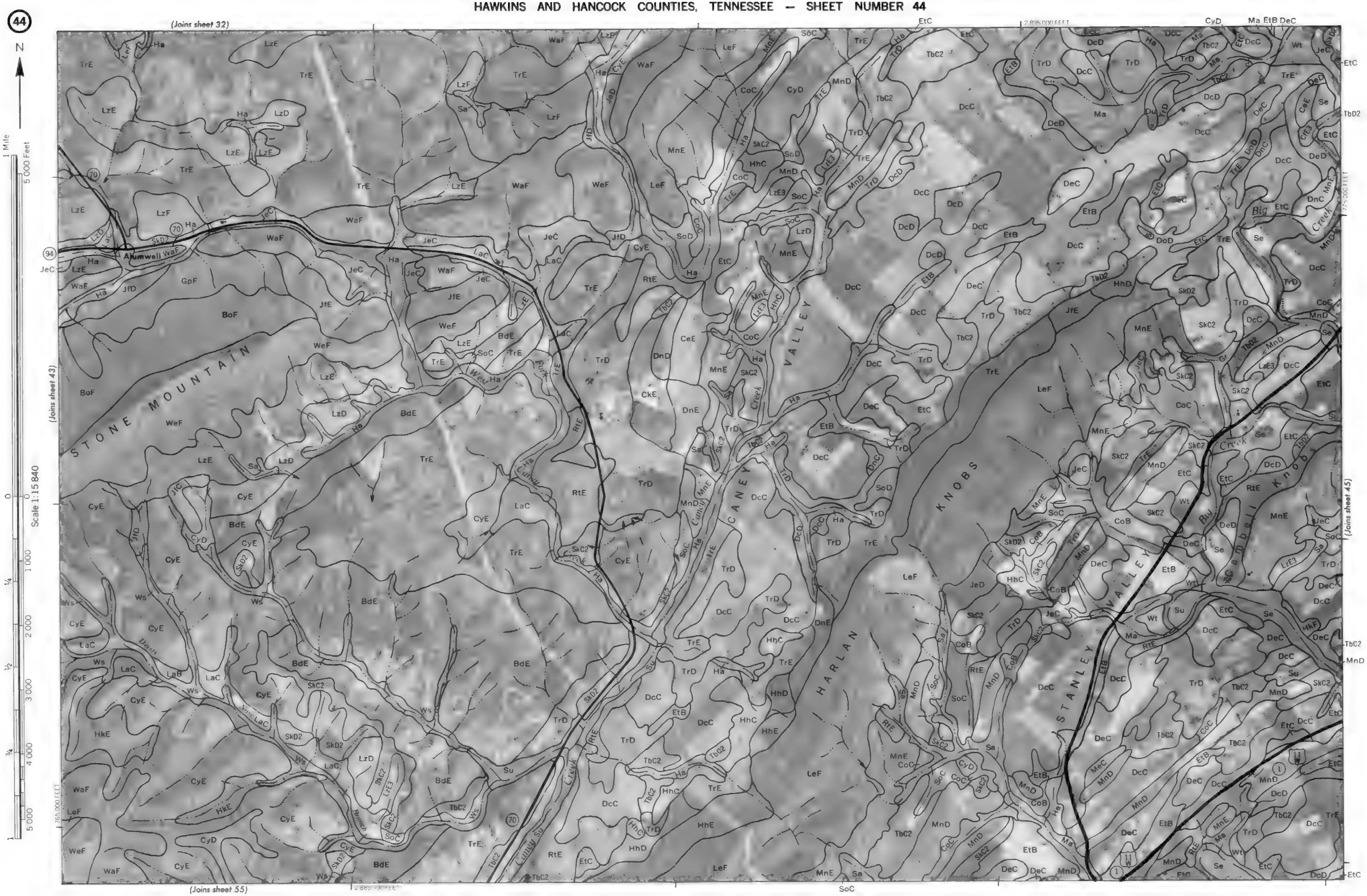
Stony Fork

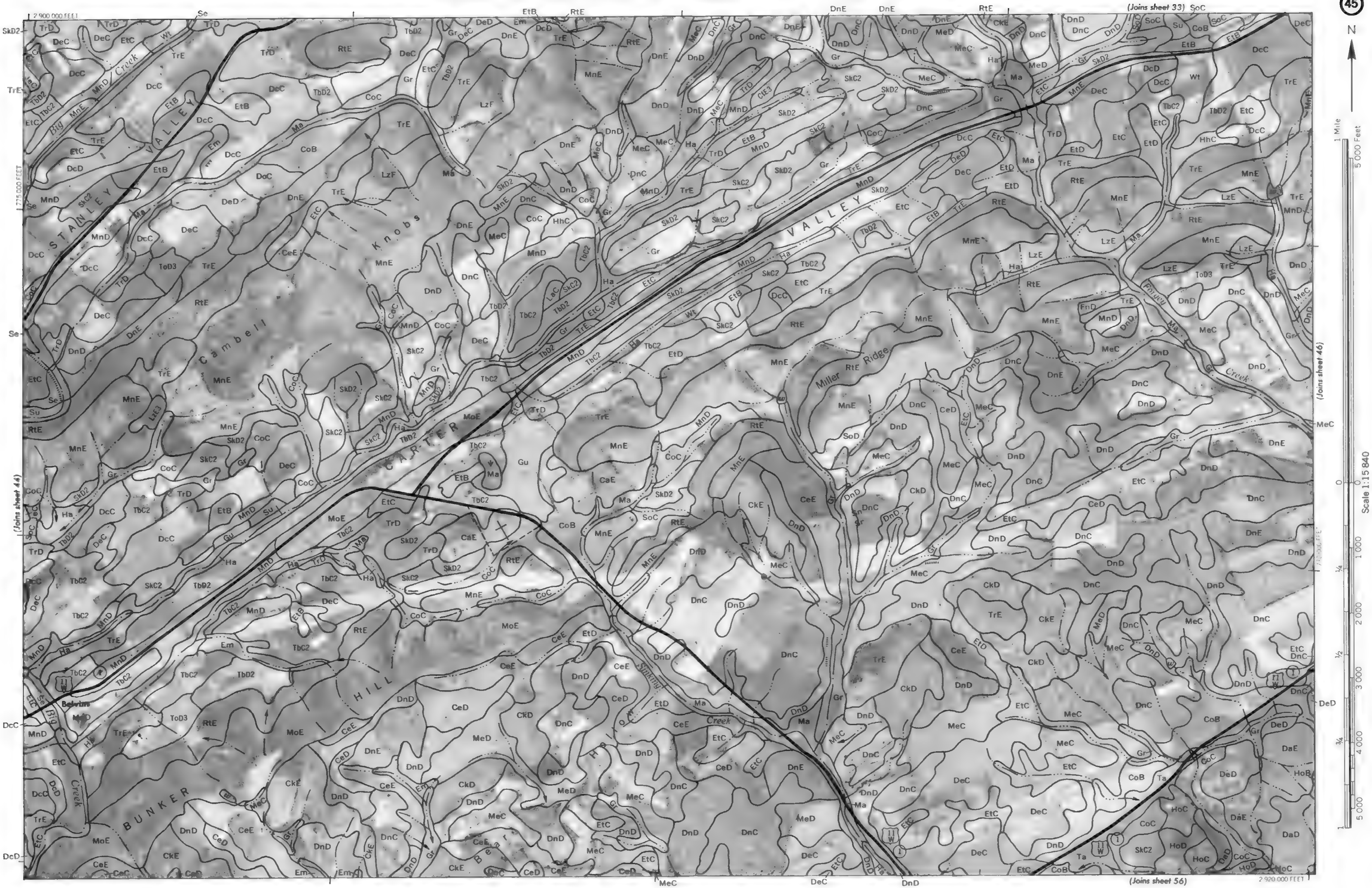
New Hope

Lee Valley

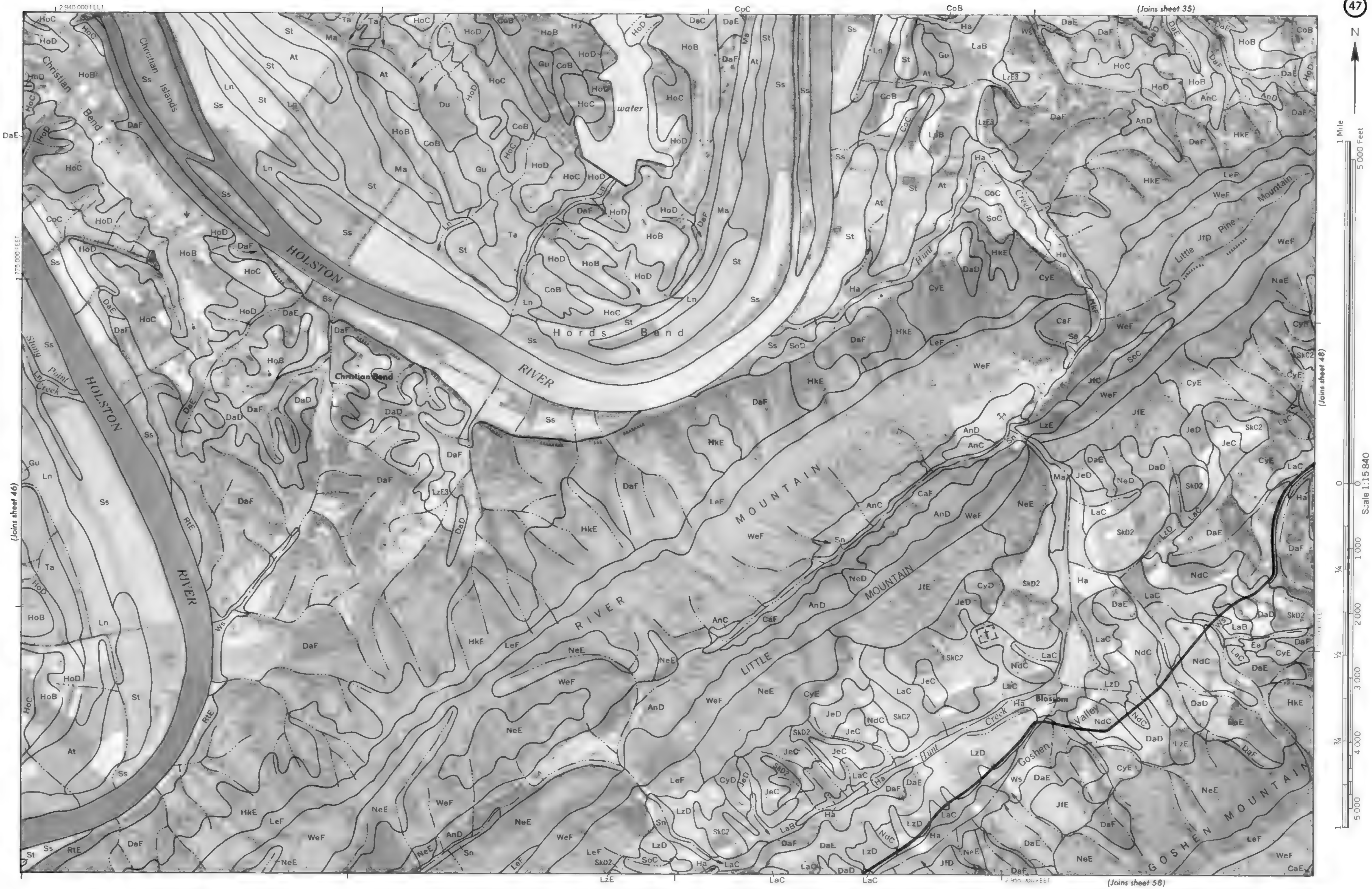

42
N
(Joins sheet 30)
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 53)
2 860 000 FEET
2 845 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
PINE RIDGE
COPPER RIDGE
CLINCH VALLEY
CLINCH MOUNTAIN
POOR VALLEY
Shiloh
Ledford Pond
Richardson Creek
Poor Valley Creek


(Joins sheet 31)
(Joins sheet 44)
(Joins sheet 54)
(Joins sheet 42)
2 865 000 FEET
2 880 000 FEET
N
1 Mile
5 000 Feet
Scale 1:15 840
CLINCH MOUNTAIN
POOR VALLEY
LITTLE POOR VALLEY
PINE MOUNTAIN
Doubling Mountain
STONE MOUNTAIN
Valley Creek
Creek
Poor Valley Creek
Laurel Branch
Devils Nose
Camelot
70
94


44
N
(Joins sheet 32)
(Joins sheet 43)
(Joins sheet 45)
(Joins sheet 55)
1 Mile
5 000 Feet
Scale 1:15 840
STONE MOUNTAIN
CANEY VALLEY
HARLAN KNOBS
STANLEY VALLEY
Campbell Knobs
Alumwell
West Fork
Caney Creek
Big Creek
Caney Su Creek
Branch
70
94
1


2 900 000 FEET
275 000 FEET
2 920 000 FEET
(Joins sheet 33)
(Joins sheet 46)
(Joins sheet 56)
(Joins sheet 44)
N
1 Mile
5 000 Feet
Scale 1:15 840
STANLEY VALLEY
Big Creek
Cambell Knobs
CARTER VALLEY
Miller Ridge
Forgey Creek
BUNKER HILL
Sinking Creek
Bear Hollow
Belvins
Big Creek
11 W
1


46
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 34)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 57)
CARTER VALLEY
Surgoinsville
Stony Point
Longs Bend
Phipps Bend
HOLSTON RIVER
HOLSTON
RIVER
SOUTHERN
Stony Point Creek
Surgoinsville Creek
Fudd Creek


(Joins sheet 35)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 58)
2 940 000 FEET
775 000 FEET
2 955 000 FEET
HOLSTON RIVER
Christian Islands
Christian Bend
Hords Bend
Stony Point Creek
MOUNTAIN RIVER
LITTLE MOUNTAIN
Little Pine Mountain
Hunt Creek
Blossom
Valley
Goshen
GOSHEN MOUNTAIN
water
N
1 Mile
5 000 Feet
Scale 1:15 840


48
N
(Joins sheet 36)
(Joins sheet 47)
(Joins inset, sheet 59)
(Joins sheet 59)
2 975 000 FEET
2 960 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000
Little Pine Mountain
Goshen Valley
Goshen Creek
Smith Gap Creek
Canebrake Mountain
Laurel Run
GOSHEN MOUNTAIN
BAYS MOUNTAINS
SULLIVAN COUNTY
GRASSY MOUNTAIN
Upper Grassy Fork
Branch
Gap Branch
Lickskillet Branch

N

1 Mile

5 000 Feet

Scale 1:15 840

2 765 000 FEET

760 000 FEET

747 000 FEET

744 000 FEET

3000 AND 5000-FOOT GRID TICKS

2 775 000 FEET

2 780 000 FEET

(Joins sheet 38)

(Joins sheet 50)

(Joins inset A,)

(Joins inset B,)

INSET A

2 770 000 FEET

(Joins lower right)

INSET B

2 778 000 FEET

(Joins lower right)

(Joins sheet 60)

3000 AND 4000-FOOT GRID TICKS

2 782 000 FEET

CLAIBORNE CO.

GRAINGER COUNTY

HANCOCK COUNTY

CLINCH RIVER

Dry Valley

Big War Creek

RIDGE

CANEY

50

N

1 Mile

5,000 Feet

Scale 1:15 840

(Joins sheet 39)

(Joins sheet 49)

(Joins sheet 51)

(Joins sheet 60)

2 785 000 FEET

CLINCH RIVER

CHESTNUT RIDGE

CANTWELL Creek Valley

Big War Creek

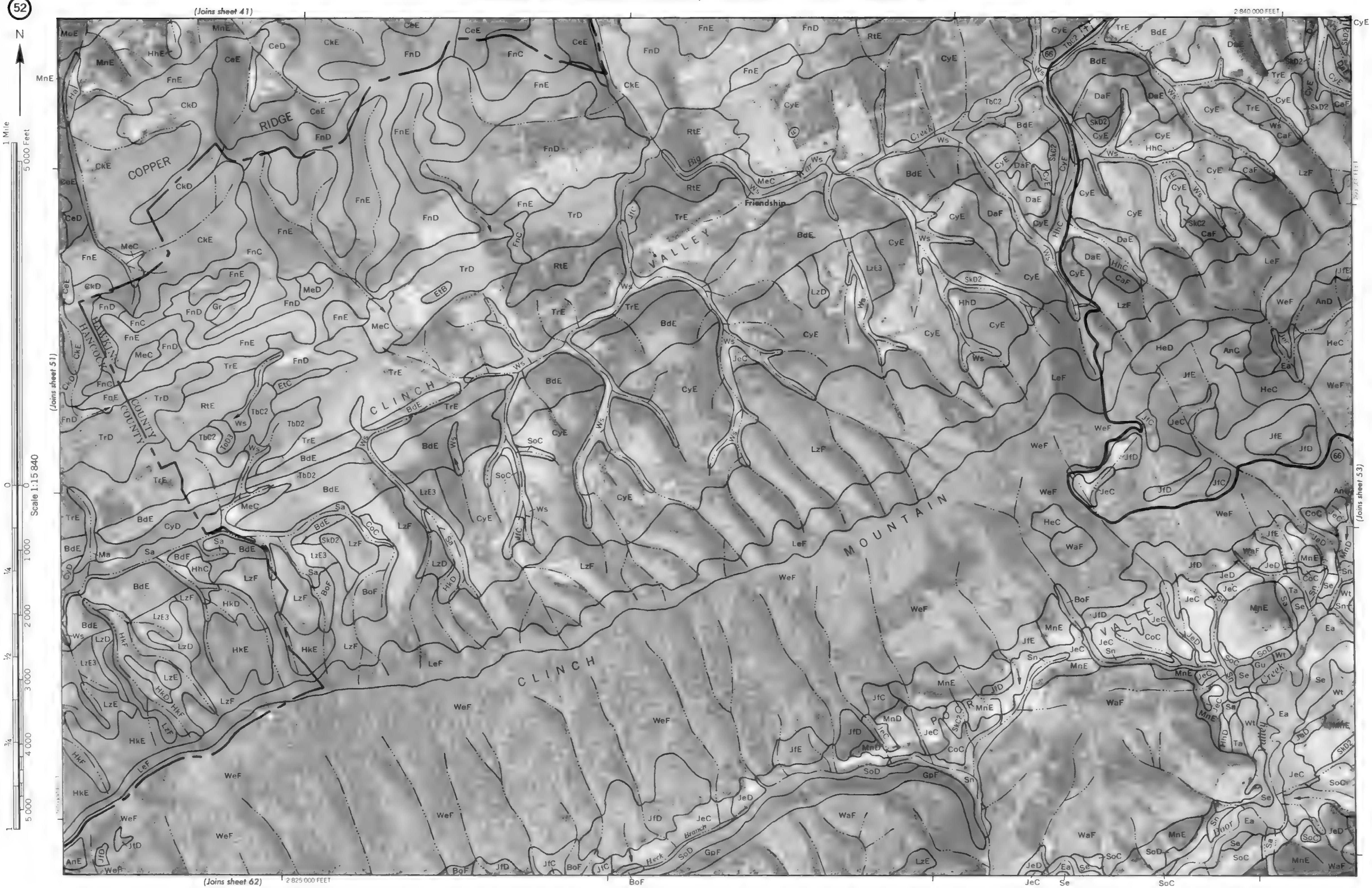
Little War Creek

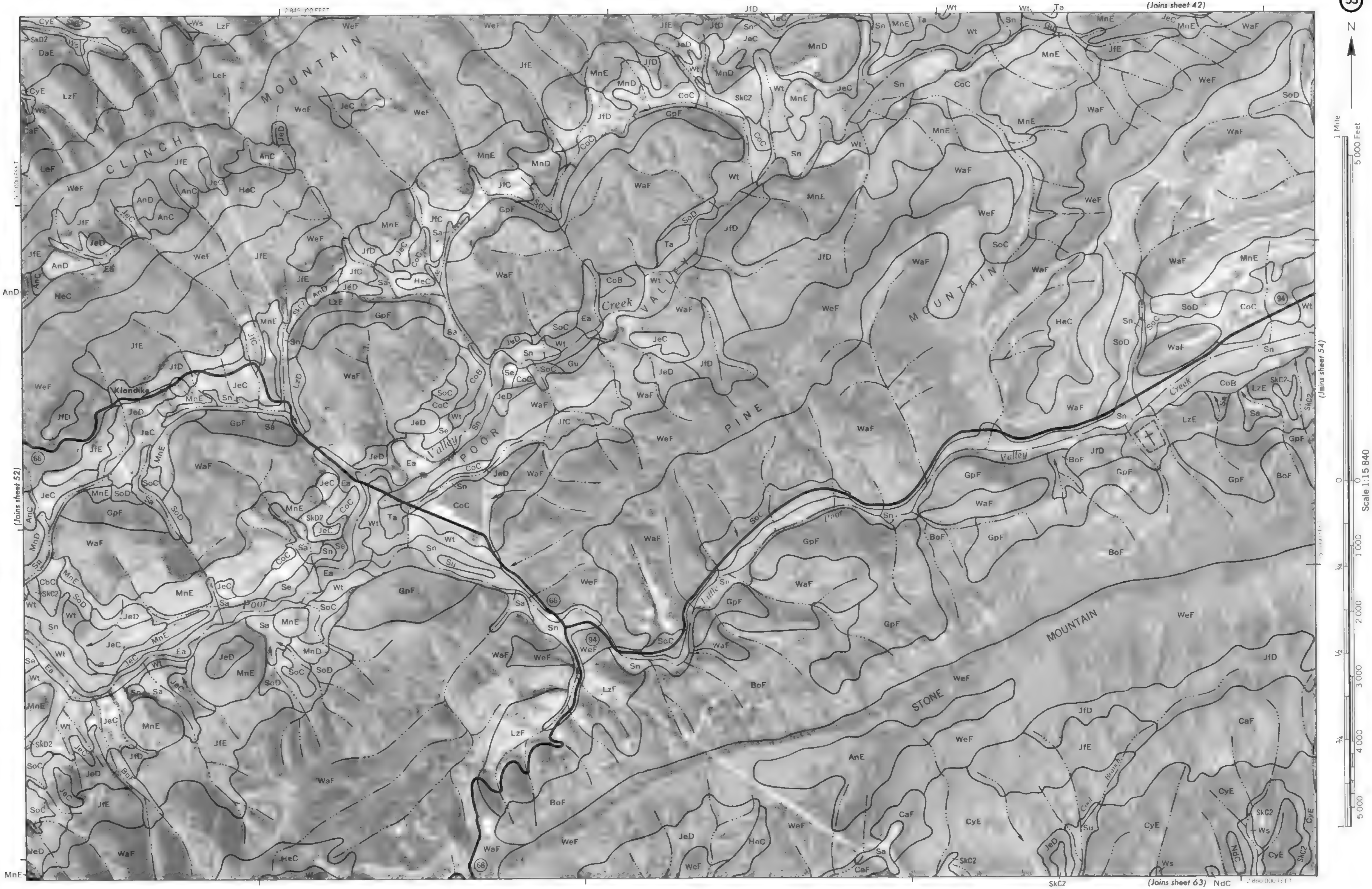
WAR RIDGE

COPPER RIDGE

Bray

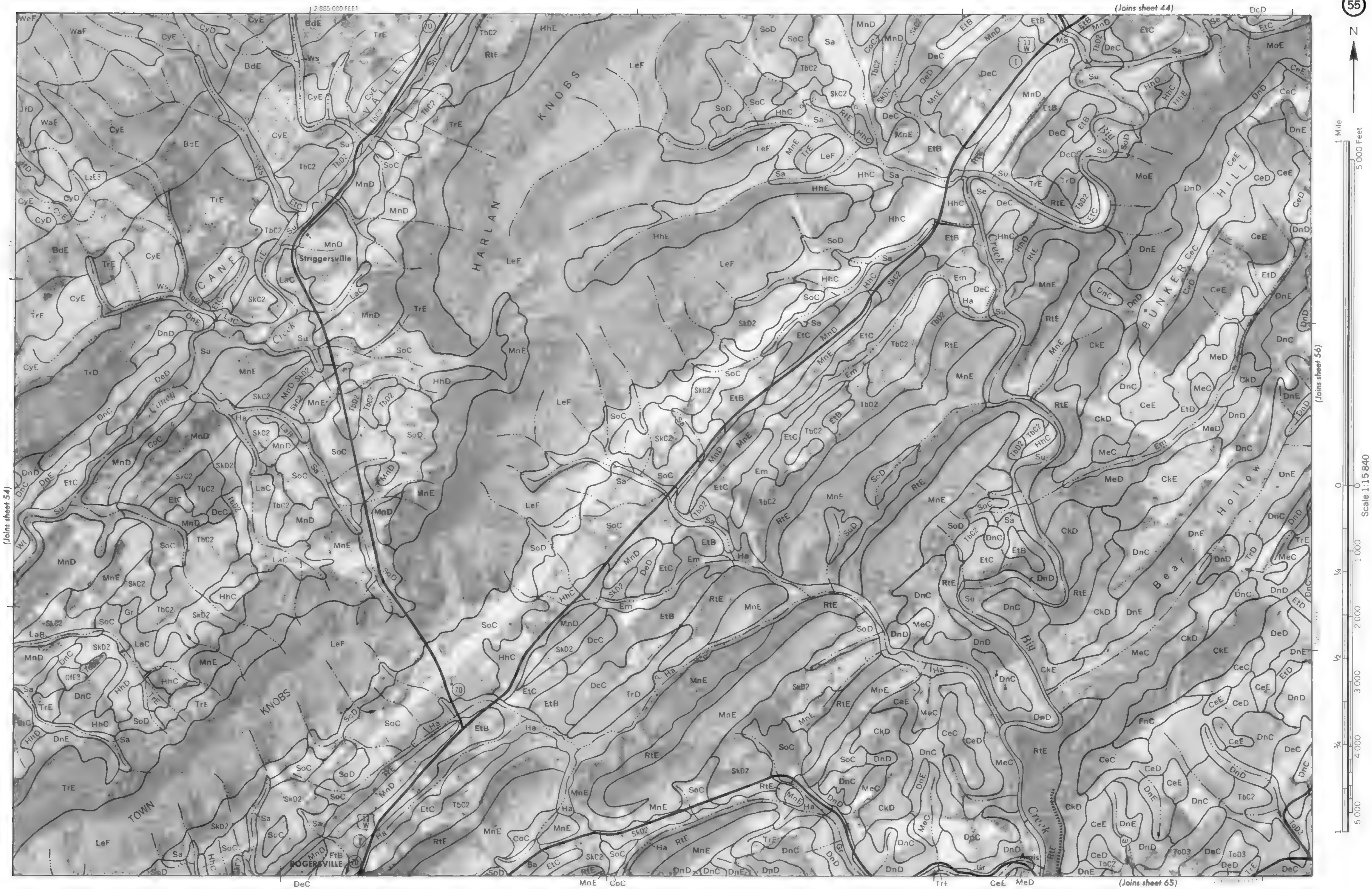

51
N
(Joins sheet 40)
(Joins sheet 50)
(Joins sheet 52)
(Joins sheet 61)
2 805 000 FEET
2 820 000 FEET
WAR RIDGE
COPPER RIDGE
CLINCH VALLEY
Riley Creek
War Creek
Big Flat Creek
Gap Creek
Little War Creek
Treadway
31
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1000
2000
3000
4000
5000

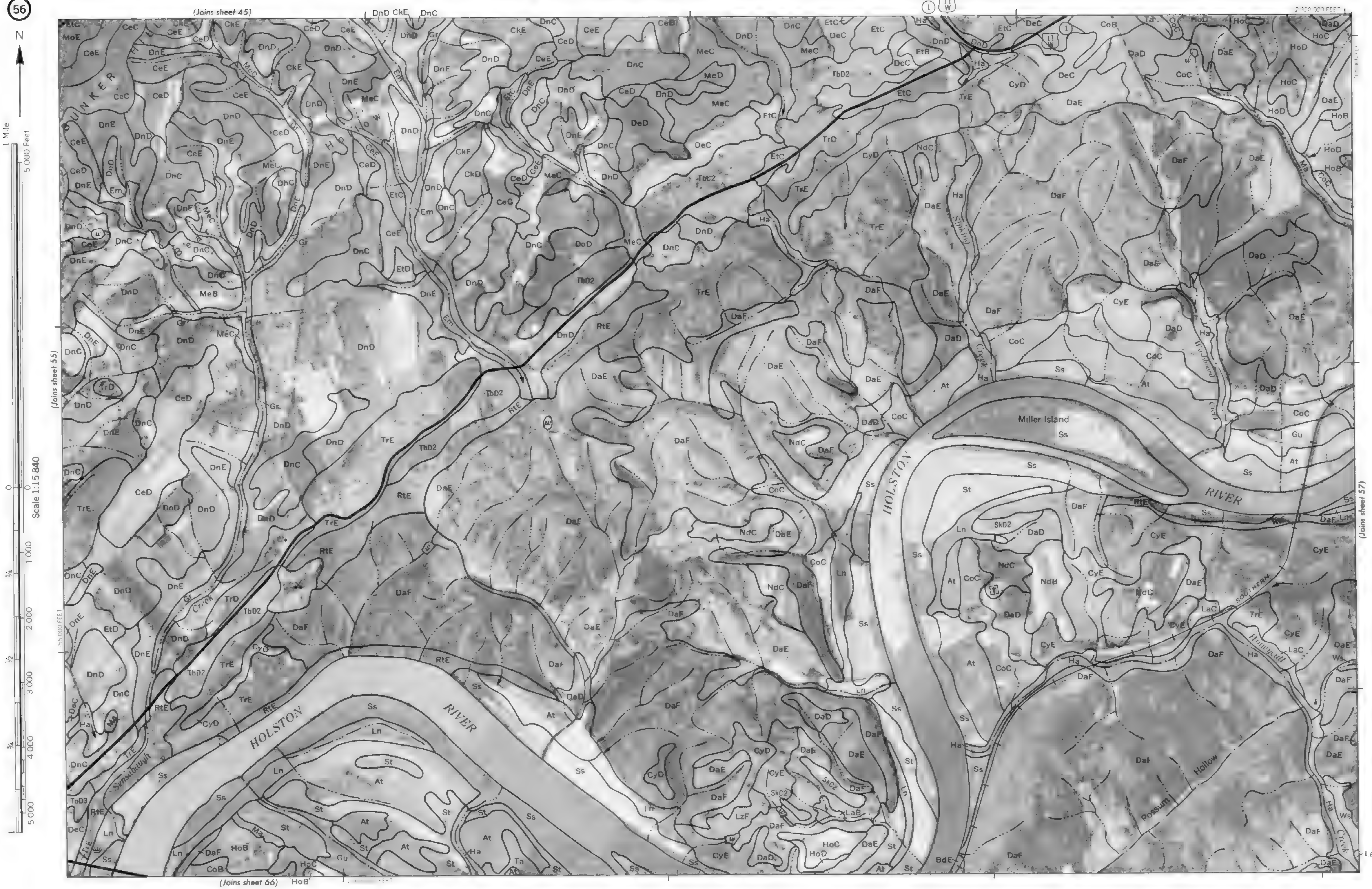

52
N
(Joins sheet 41)
2 840 000 FEET
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 62)
2 825 000 FEET
1 Mile
5 000 Feet
0
Scale 1:15 840
COPPER
RIDGE
HAWKINS
HANCOCK
COUNTY
Friendship
Big
War
Creek
CLINCH
VALLEY
CLINCH
MOUNTAIN
POOR
VALLEY
Poor
Valley
Creek
Heck
Branch
66


(Joins sheet 42)
(Joins sheet 52)
(Joins sheet 54)
(Joins sheet 63)
CLINCH MOUNTAIN
POOR VALLEY
PINE MOUNTAIN
Poor Valley Creek
STONE MOUNTAIN
Little
Klondike
66
94
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 54

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 55




56
N
(Joins sheet 45)
(Joins sheet 55)
(Joins sheet 57)
(Joins sheet 66)
1 Mile
5 000 Feet
Scale 1:15 840
HOLSTON RIVER
HOLSTON
RIVER
Miller Island
Possum Hollow
Creek
SOUTHERN


(Joins sheet 46)
(Joins sheet 56)
(Joins sheet 58)
(Joins sheet 67)
2 925 000 FEET
2 940 000 FEET
N
Scale 1:15 840
1 Mile
5 000 Feet
HOLSTON RIVER
SOUTHERN
PUPS KNOBS
HENNARD MOUNTAIN
ALEC MOUNTAIN
WAR VALLEY
NORTH FORK VALLEY
Graveyard Hill
Forgey Creek
Terrill Creek
Honeycutt Creek
North Fork

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 58

58

N

Scale 1:15 840

1 Mile

5 000 Feet

(Joins sheet 47)

(Joins sheet 57)

(Joins sheet 59)

(Joins sheet 68)

2 955 000 FEET

2 945 000 FEET

765 000 FEET

755 000 FEET

RIVER MOUNTAIN

ALEC VALLEY

MOUNTAIN

Terrill Ha Creek

RIVER

GOSHEN VALLEY

MOUNTAIN

Grassy Fork

NORTH FORK

GOSHEN VALLEY

GRASSY MOUNTAINS

Big Double Branch

BAYS

(Joins sheet 48)

2 960 000 FEET

GRASSY MOUNTAIN

MOUNTAINS

BAYS

Valley Fork

Grassy Branch

Double Branch

Big Creek

Beech Creek

Limestone Branch

Little Mountain

CHIMNEYTOP MOUNTAIN

SULLIVAN COUNTY

WASHINGTON COUNTY

(Joins sheet 58)

(Joins sheet 69)

2 975 000 FEET

59

N

1 Mile

5 000 Feet

Scale 1:15 840

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 60

60

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000 FEET

(Joins sheet 50)

(Joins inset B, sheet 49)

2 800 000 FEET

2 785 000 FEET

735 000 FEET

745 000 FEET

(Joins sheet 61)

(Joins sheet 70)

(Joins lower right)

(Joins inset)

4000 AND 5000 FOOT GRID TICKS

RIDGE

COPPER

VALLEY

CLINCH

MOUNTAIN

GRAINGER COUNTY

HANCOCK CO

HAWKINS CO

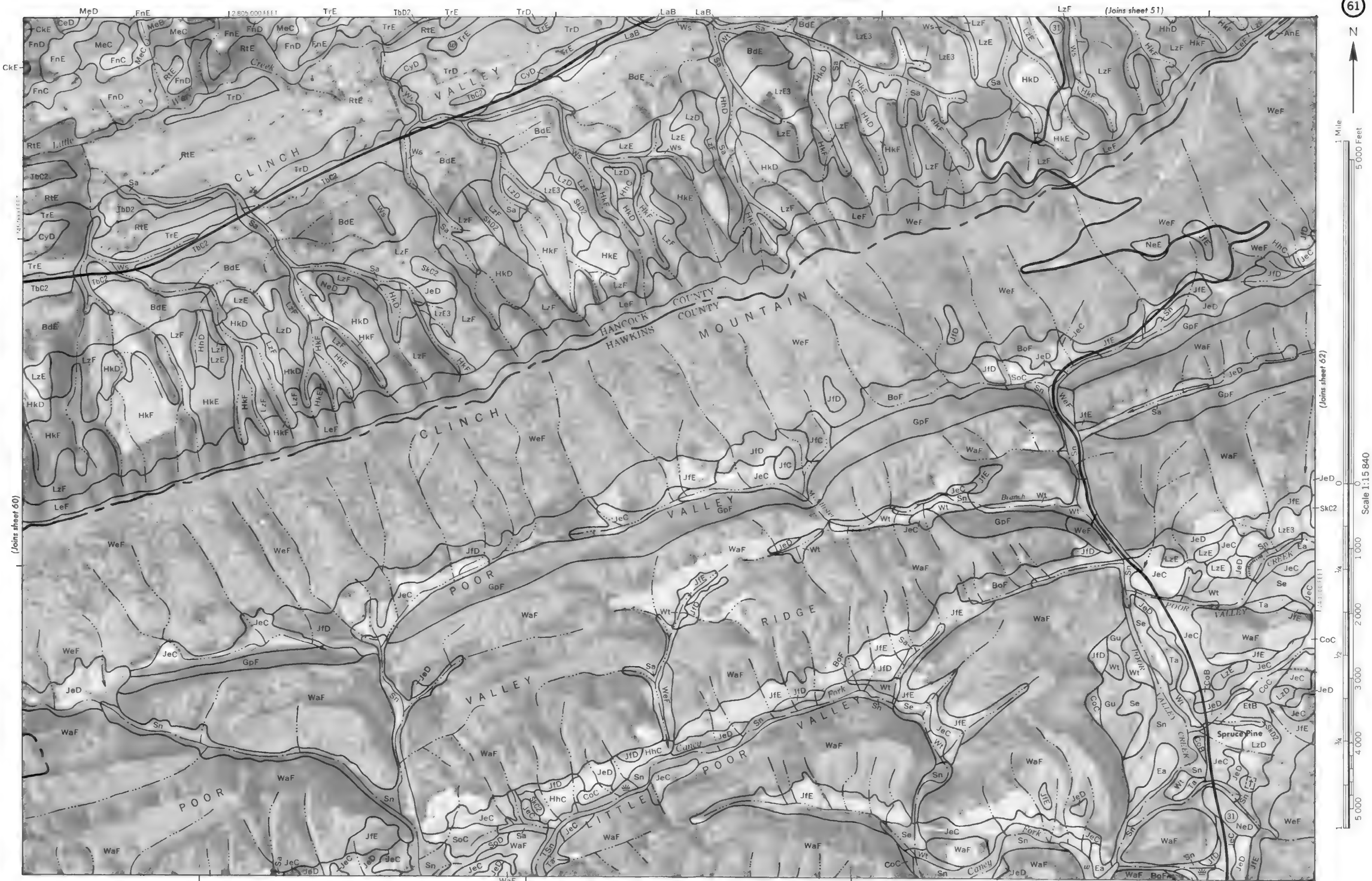
POOR VALLEY RIDGE

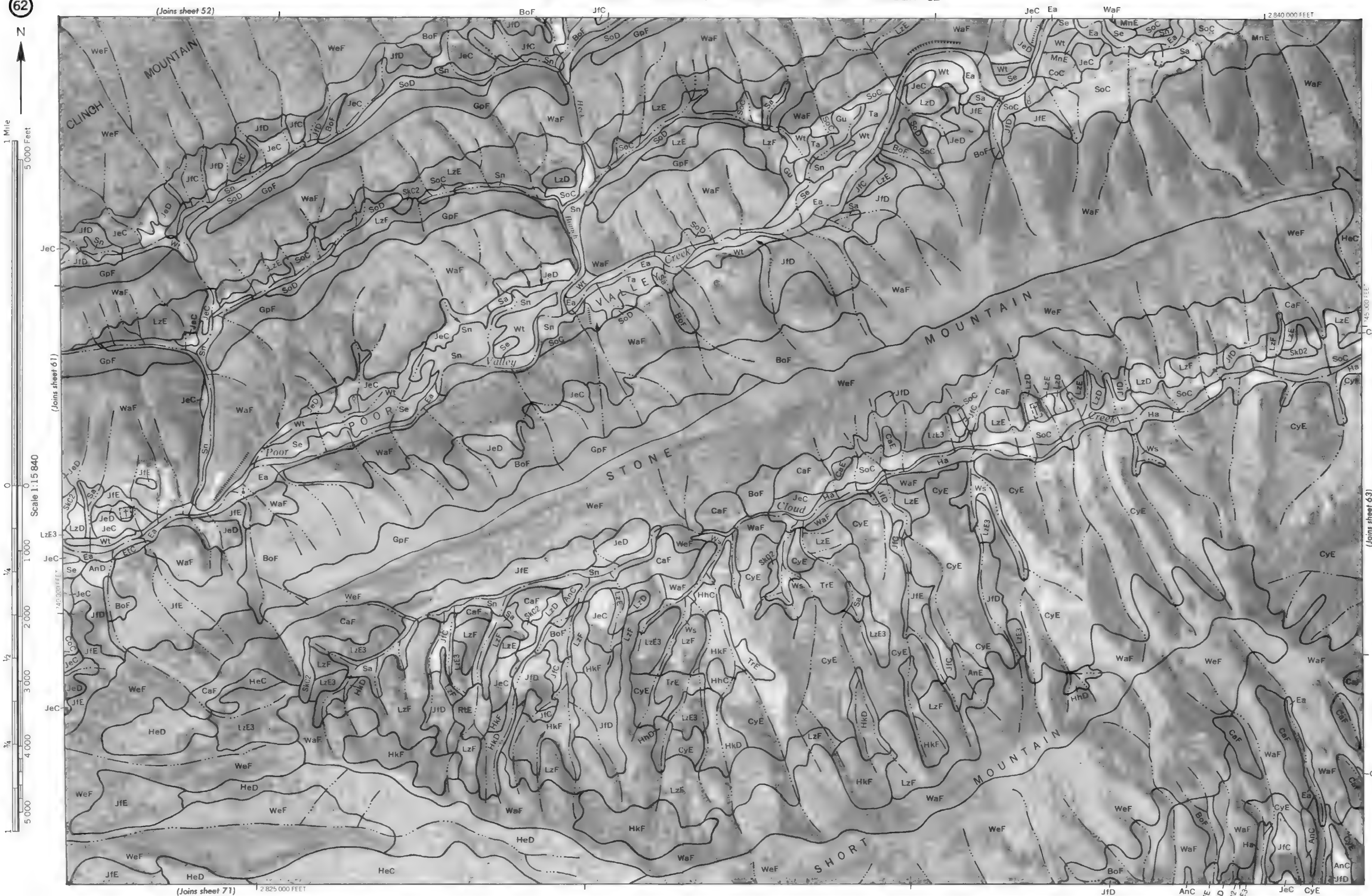
LITTLE POOR VALLEY

Creek

River

Sa MoE MnE CeE CeD CeC CkE CkD FnE FnC FnD MeC MeD Gr TrE TrD TbC2 TbD2 RtE CyD Ws BdE HhC HkD HkE HkF LzE LzF LzD LeF WeF JeD JeC CoG CoC SkC2 SkD2 Ha WaF DaF EtC


(Joins sheet 51)
(Joins sheet 60)
(Joins sheet 62)
(Joins sheet 70)
2 805 000 FEET
N
CLINCH VALLEY
CLINCH MOUNTAIN
HANCOCK COUNTY
HAWKINS COUNTY
POOR VALLEY
POOR VALLEY RIDGE
LITTLE POOR VALLEY
Little Creek
Caney Fork
Poor Valley Creek
Spruce Pine
Branch
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000


62
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 52)
(Joins sheet 61)
(Joins sheet 63)
(Joins sheet 71)
2 840 000 FEET
2 825 000 FEET
145 000 FEET
CLINCH MOUNTAIN
POOR VALLEY
Poor Valley Creek
STONE MOUNTAIN
SHORT MOUNTAIN
Cloud Creek


(Joins sheet 53)
(Joins sheet 62)
(Joins sheet 64)
(Joins sheet 72)
2 845 000 FEET
2 860 000 FEET
N
Scale 1:15 840
1 Mile
5 000 Feet
STONE MOUNTAIN
SHORT MOUNTAIN
Altonville
Marble Hall
CHEROKEE LAKE
Cloud Creek
Dry Branch
Stock Creek
Caney Creek

64

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

(Joins sheet 54)

(Joins sheet 63)

(Joins sheet 73)

(Joins sheet 65)

2 880 000 FEET

2 865 000 FEET

7 500 000 FEET

Valley Creek

Stock Creek

Cedar Creek

Caney Creek

Crockett Creek

Creek

VALLEY

CANEY

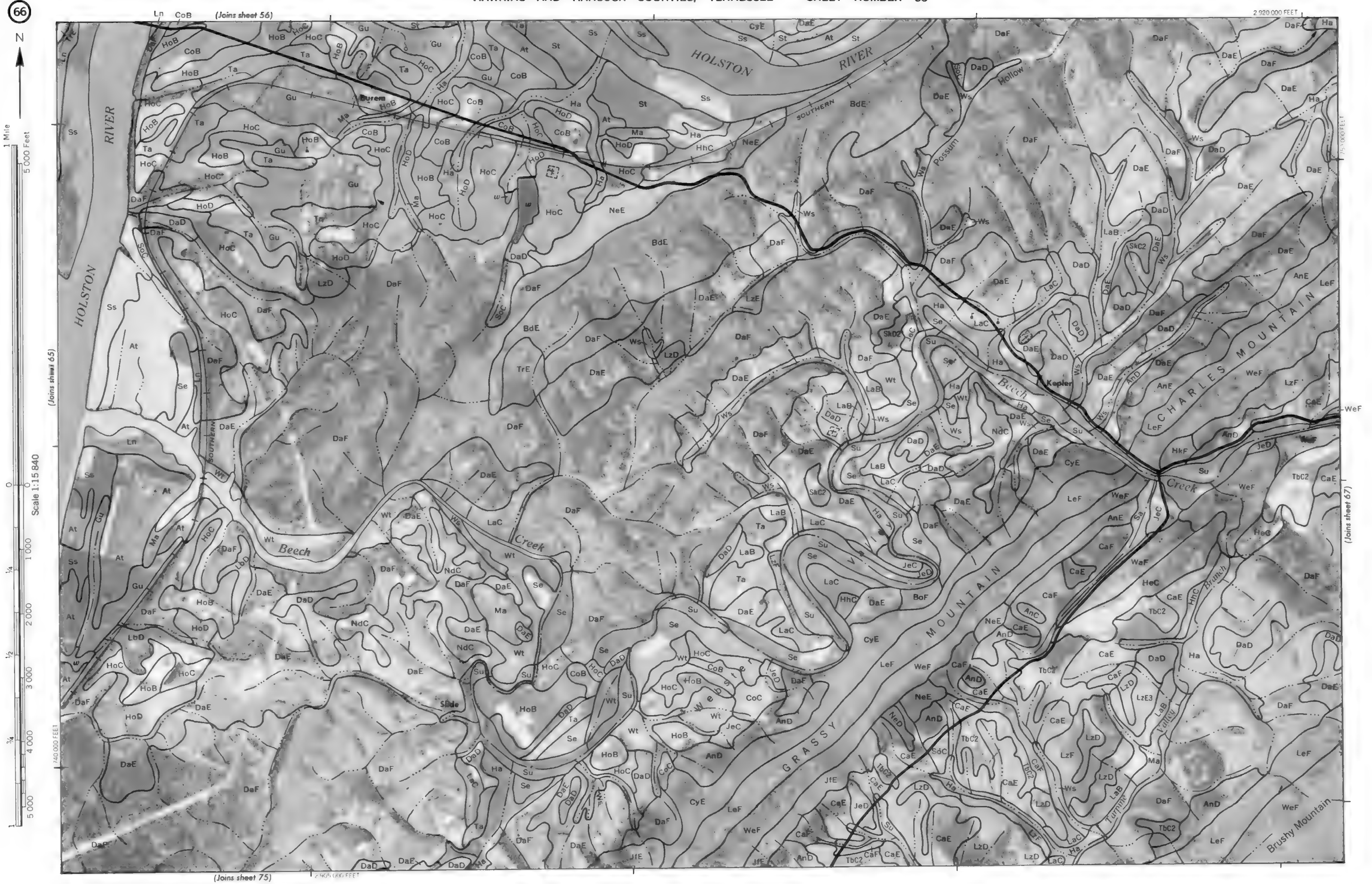
KNOBS

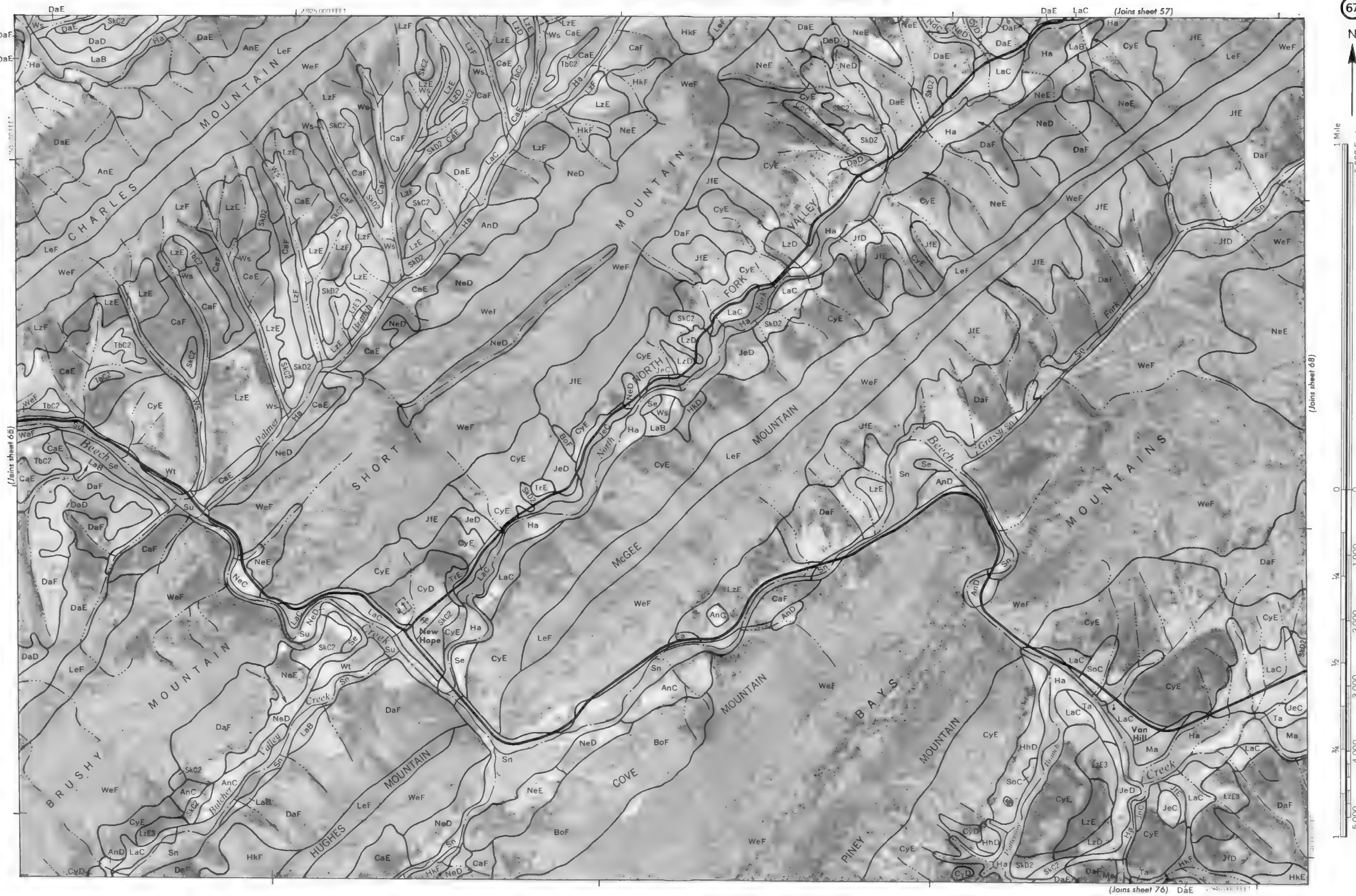
TOWN

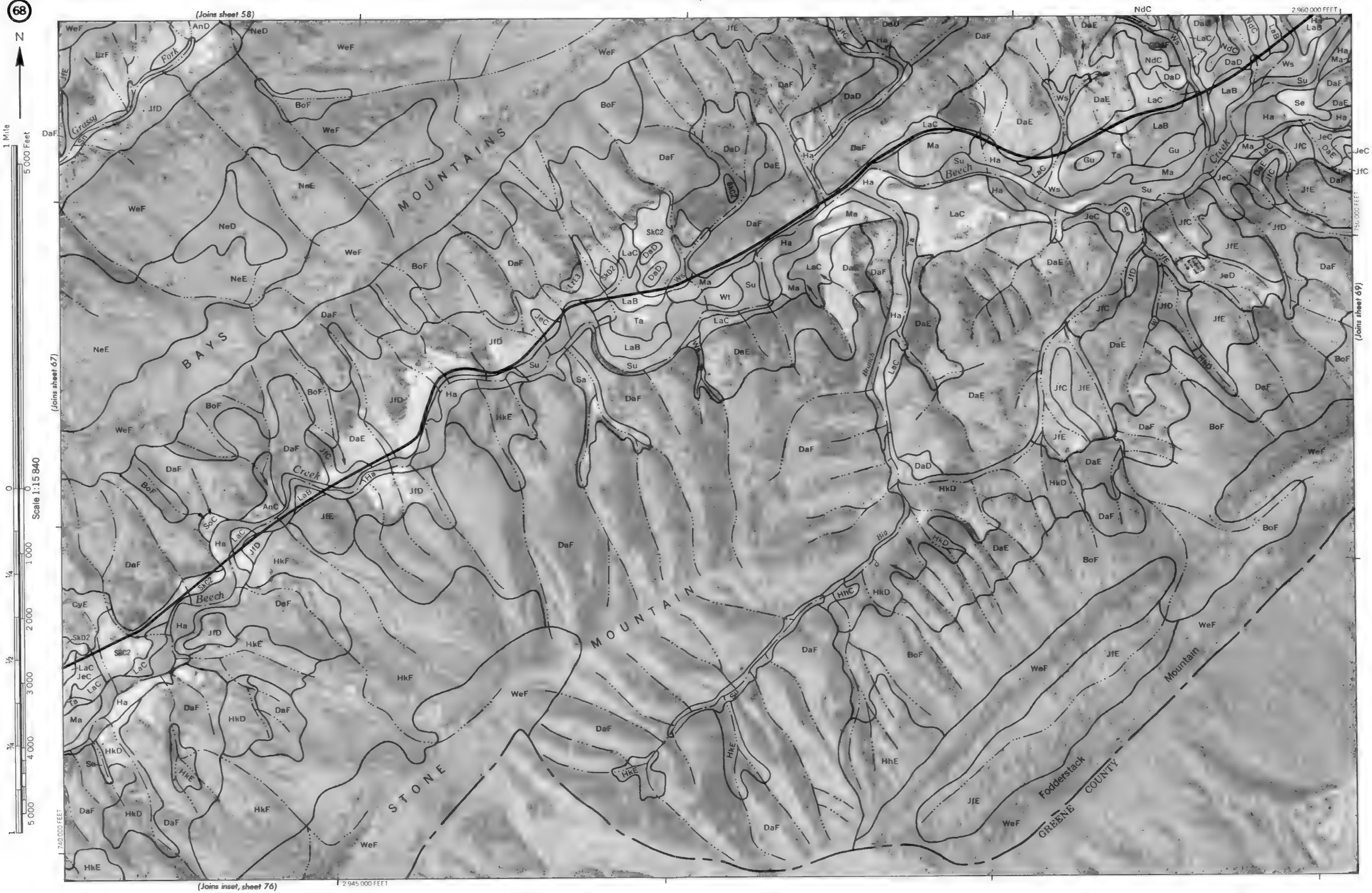
ROGERSVILLE
(county seat)

Henardtown


65
N
(Joins sheet 55)
(Joins sheet 66)
(Joins sheet 74)
(Joins sheet 64)
ROGERSVILLE
(county seat)
Petersburg
Guntown
Amis
Cave Ridge
Crockett Creek
Big Creek
HOLSTON RIVER
JOHN SEVIER DETENTION RESERVOIR
SOUTHERN
1 Mile
5 000 Feet
Scale 1:15 840


66
N
(Joins sheet 56)
(Joins sheet 65)
(Joins sheet 67)
(Joins sheet 75)
2 920 000 FEET
2 905 000 FEET
740 000 FEET
755 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
HOLSTON RIVER
HOLSTON
RIVER
SOUTHERN
Burem
Possum Hollow
Beech Creek
Kepler
CHARLES MOUNTAIN
GRASSY MOUNTAIN
Slide
Webb
Branch
Turpin Valley
Brushy Mountain


67
N
(Joins sheet 57)
(Joins sheet 68)
(Joins sheet 66)
(Joins sheet 76)
CHARLES MOUNTAIN
SHORT MOUNTAIN
NORTH FORK VALLEY
McGEE MOUNTAIN
BRUSHY MOUNTAIN
HUGHES MOUNTAIN
COVE MOUNTAIN
PINEY BAYS MOUNTAIN
MOUNTAINS
New Hope
Van Hill
Beech Creek
Butcher Valley Creek
Palmer Branch
North Fork
Grassy Fork
1 Mile
5 000 Feet
Scale 1:15 840
0
1000
2000
3000
4000
5000
¼
½
¾
1


N
(Joins sheet 58)
(Joins sheet 67)
(Joins sheet 69)
(Joins inset, sheet 76)
2 960 000 FEET
2 945 000 FEET
750 000 FEET
740 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾
1
Grassy
Fork
BAYS
MOUNTAINS
Beech
Creek
Branch
Big
STONE
MOUNTAIN
Fodderstack
Mountain
GREENE
COUNTY


(Joins sheet 59)
(Joins sheet 68)
(Joins sheet 37)
(Joins sheet 48)
2 965 000 FEET
2 980 000 FEET
2 985 000 FEET
745 000 FEET
775 000 FEET
CHIMNEYTOP MOUNTAIN
WASHINGTON COUNTY
GREENE COUNTY
Fodderstack Mountain
Beech Creek
BAYS MOUNTAINS
SULLIVAN COUNTY
Pretty Ridge
Cherry Knobs
Laurel Run
N
1 Mile
5 000 Feet
Scale 1:15 840

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 70

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 71

71

N

2 825 000 FEET

735 000 FEET

(Joins sheet 62)

(Joins sheet 70)

(Joins sheet 72)

(Joins sheet 78)

2 840 000 FEET

725 000 FEET

MOUNTAIN

SHORT

POOR VALLEY CREEK

RIVER

HOLSTON RIVER

KNOBS

Galbraith Branch

Redhouse Branch

Quarry Branch

Potato Hill

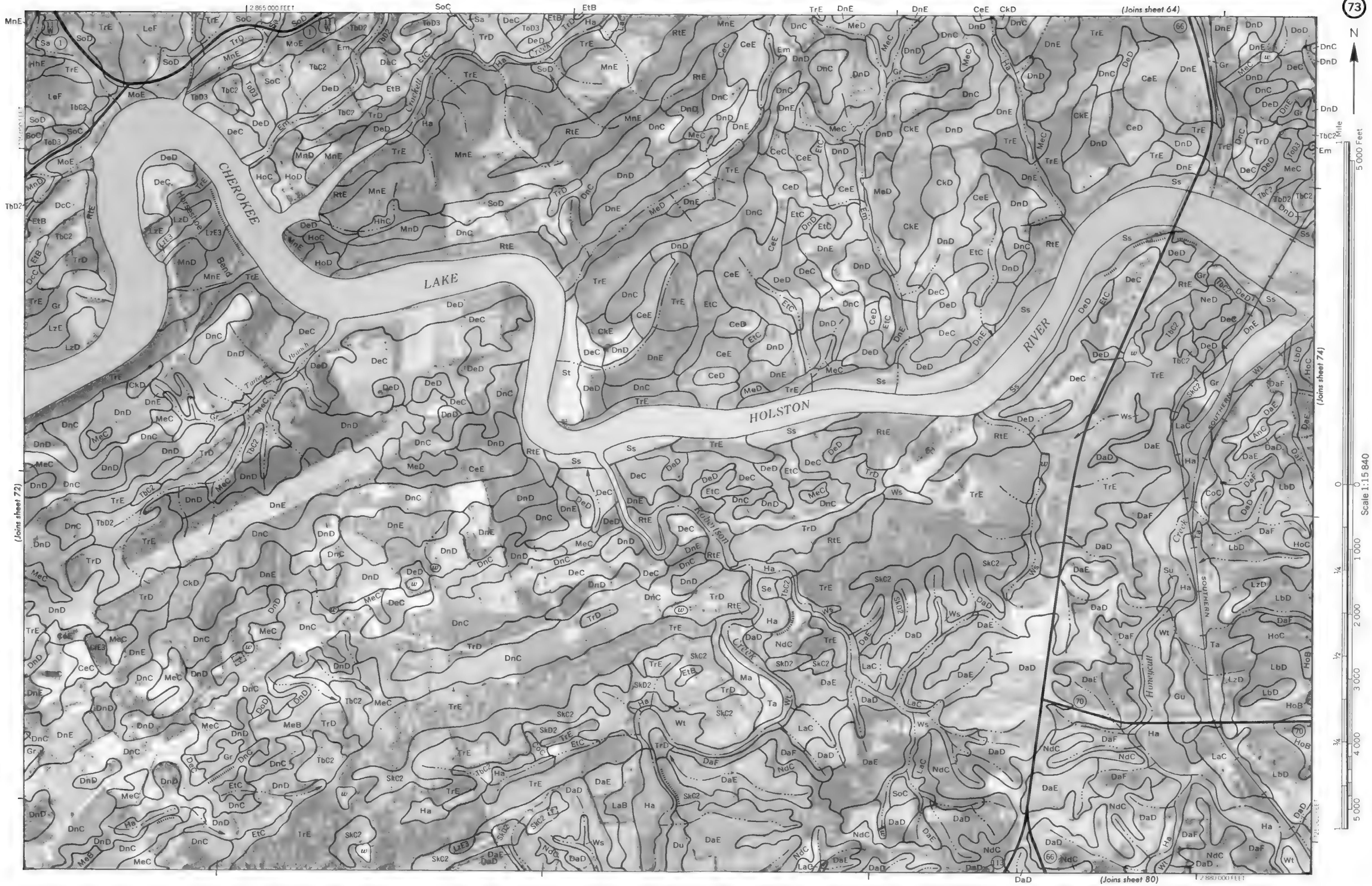
Rogers High Point

Scale 1:15 840

1 Mile

5 000 Feet

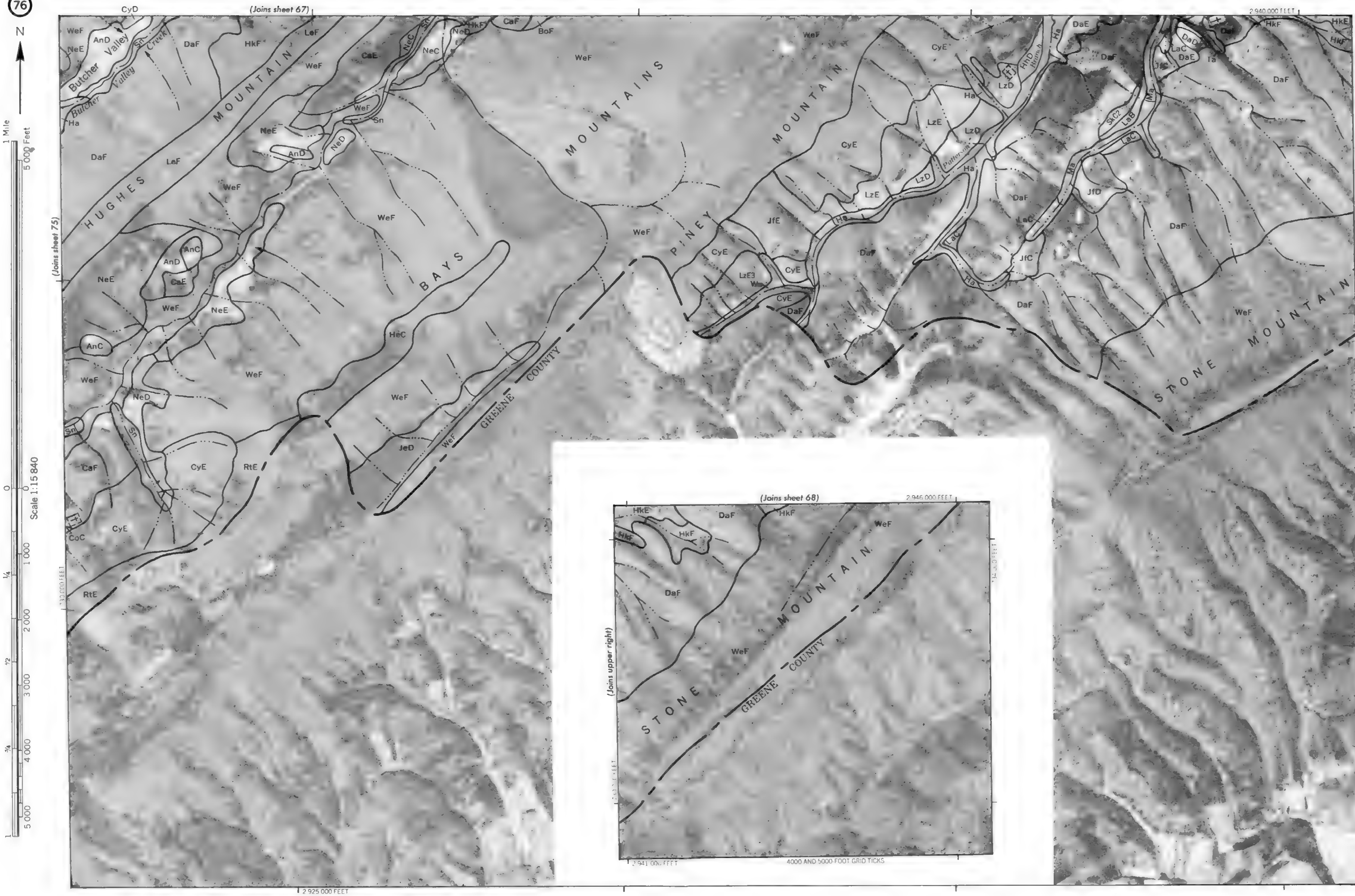

72
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 63)
(Joins sheet 71)
(Joins sheet 73)
(Joins sheet 79)
2 860 000 FEET
2 845 000 FEET
Cuba
HOLSTON
RIVER
CHEROKEE
LAKE
KNOBS
LEE
VALLEY


73
N
(Joins sheet 64)
(Joins sheet 72)
(Joins sheet 74)
(Joins sheet 80)
2 865 000 FEET
2 880 000 FEET
CHEROKEE
LAKE
HOLSTON
RIVER
Horseshoe Bend
Crockett Creek
Tartus Branch
Robertson Creek
Honeycutt Creek
SOUTHERN
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000


74
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 65)
(Joins sheet 73)
(Joins sheet 75)
(Joins sheet 81)
2 900 000 FEET
2 885 000 FEET
JOHN SEVIER DETENTION
RESERVOIR
HOLSTON
RIVER
CHEROKEE
LAKE
SOUTHERN
McCloud
Chalk Level
Dodson Creek
Branch
Webster
Valley
Creek
Dodson
Mountain
Strahl
70

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 75

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 76



(Joins sheet 70)

(Joins sheet 78)

(Joins sheet 82)

2 805 000 FEET

1 720 000 FEET

2 720 000 FEET

MOSELEY RIDGE

PROPHET RIDGE

Indian Grave Hill

GRAINGER COUNTY

CHEROKEE LAKE

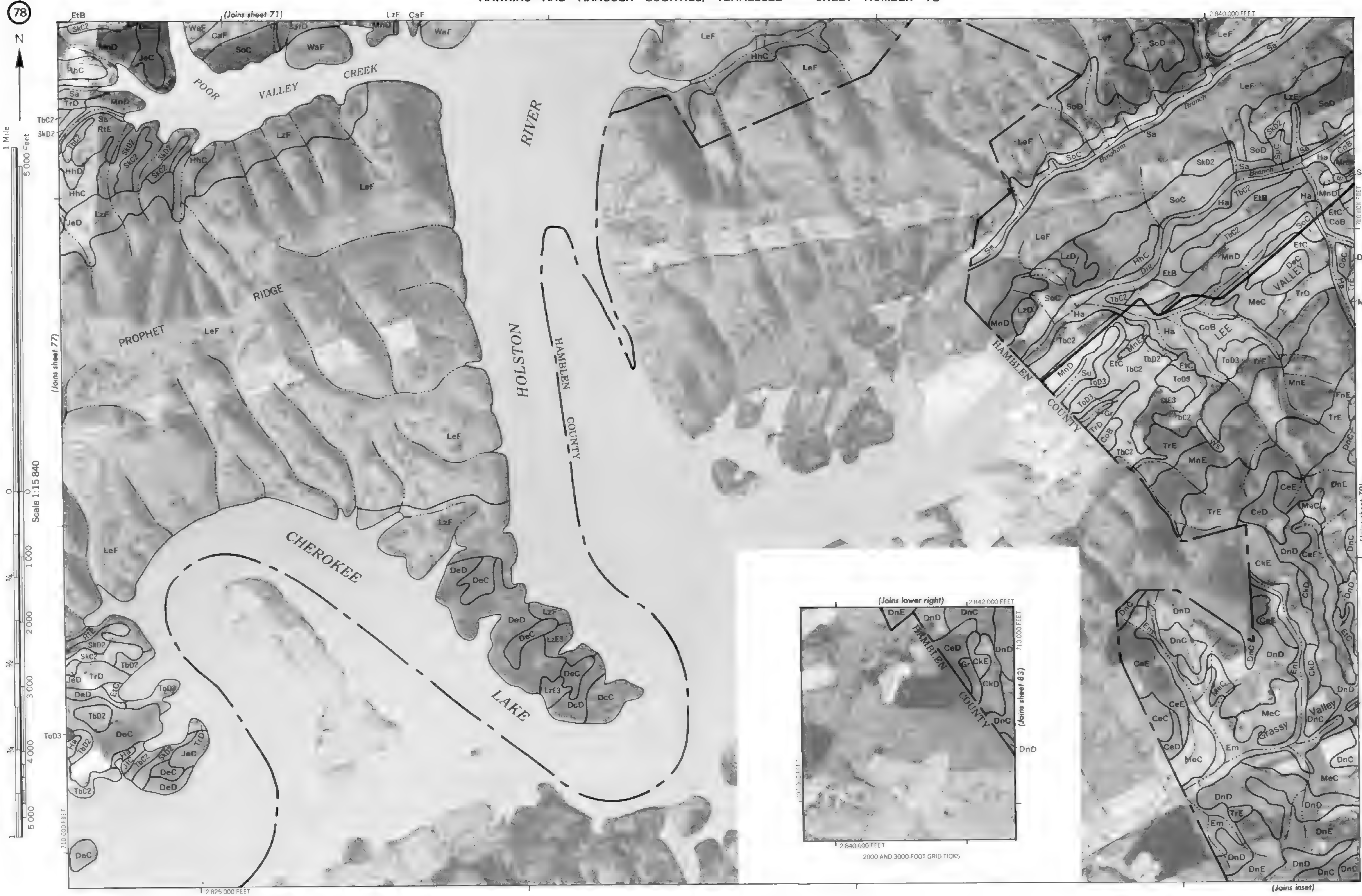
HOLSTON RIVER

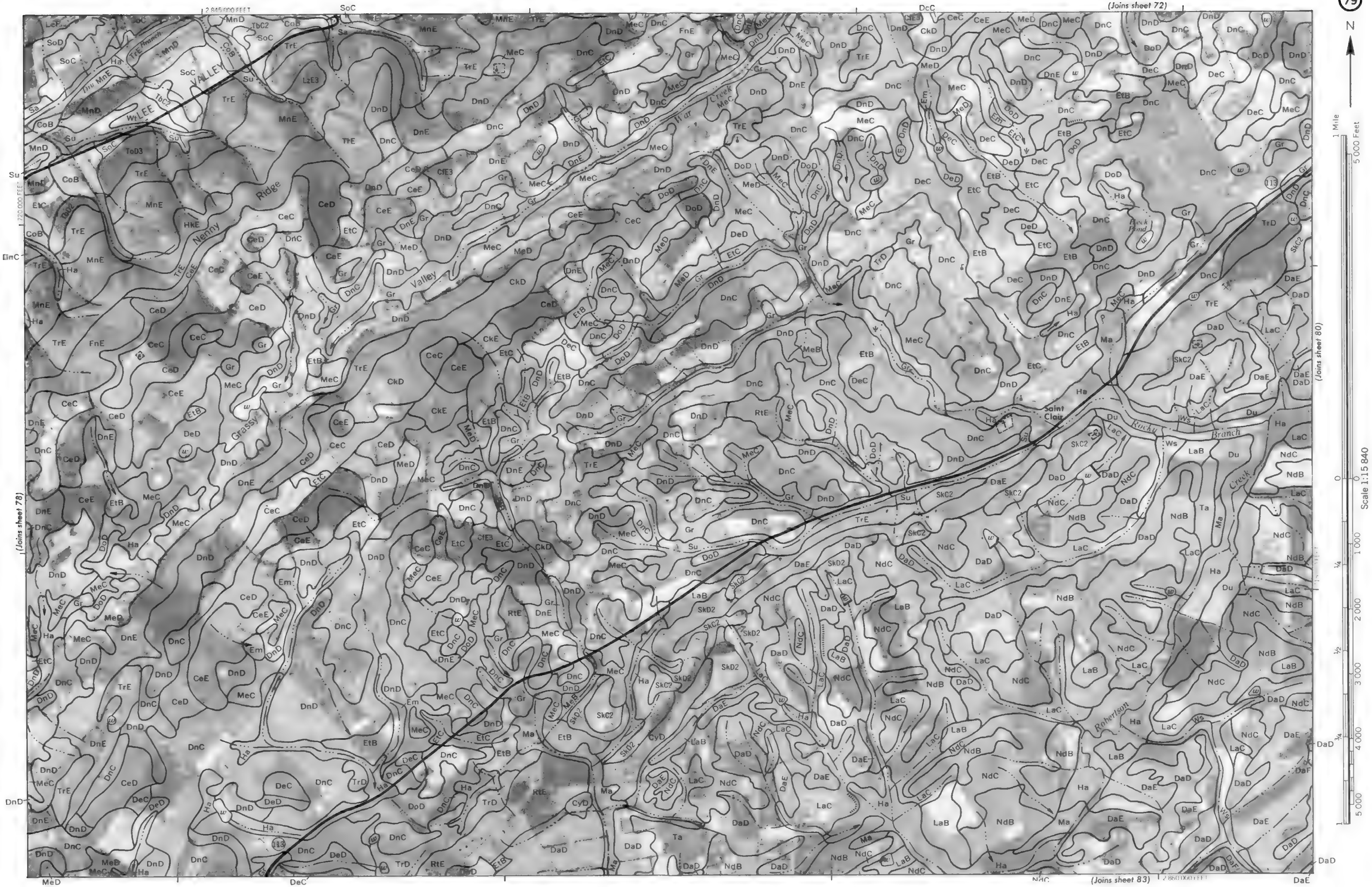
N

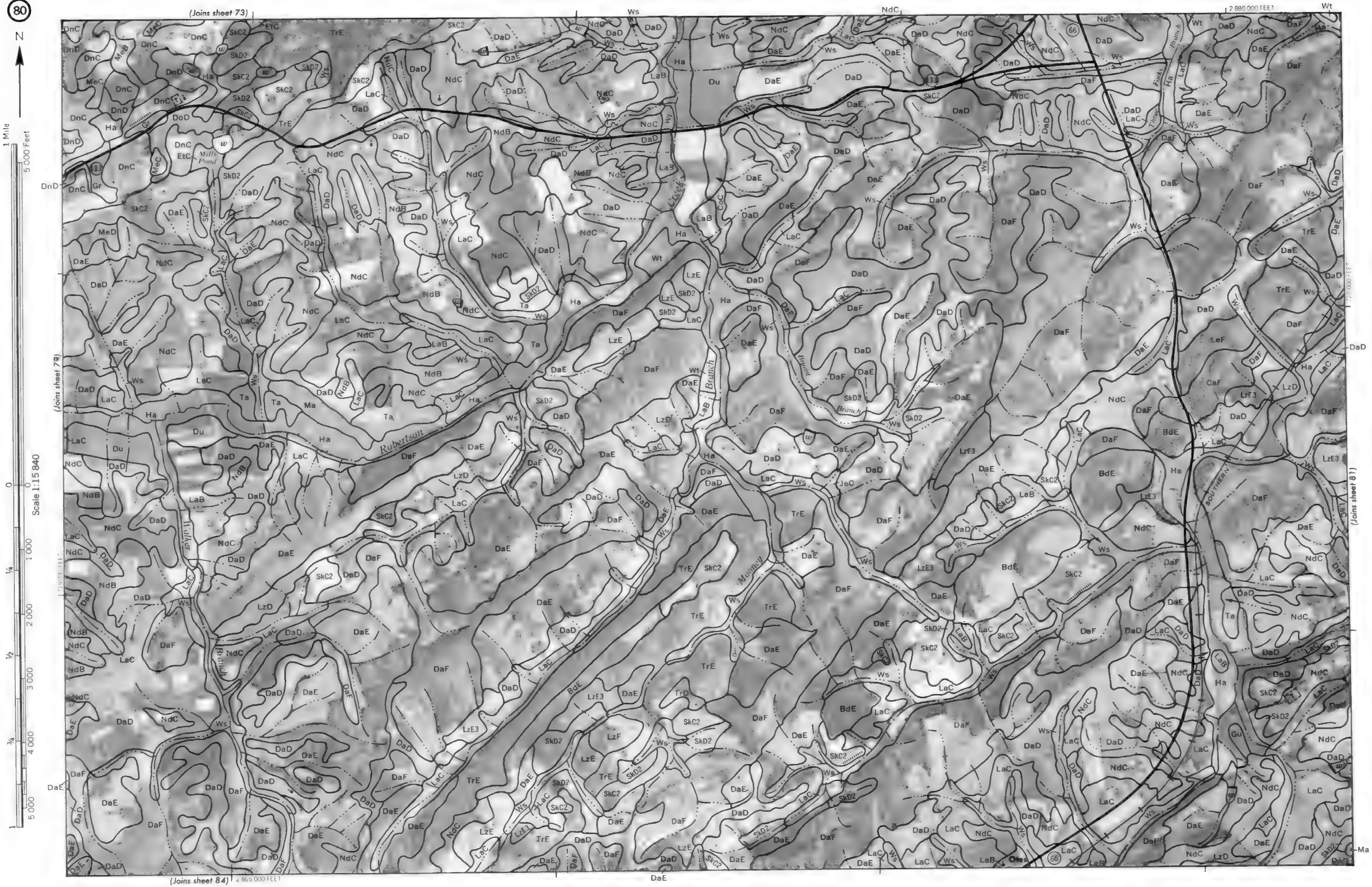
1 Mile

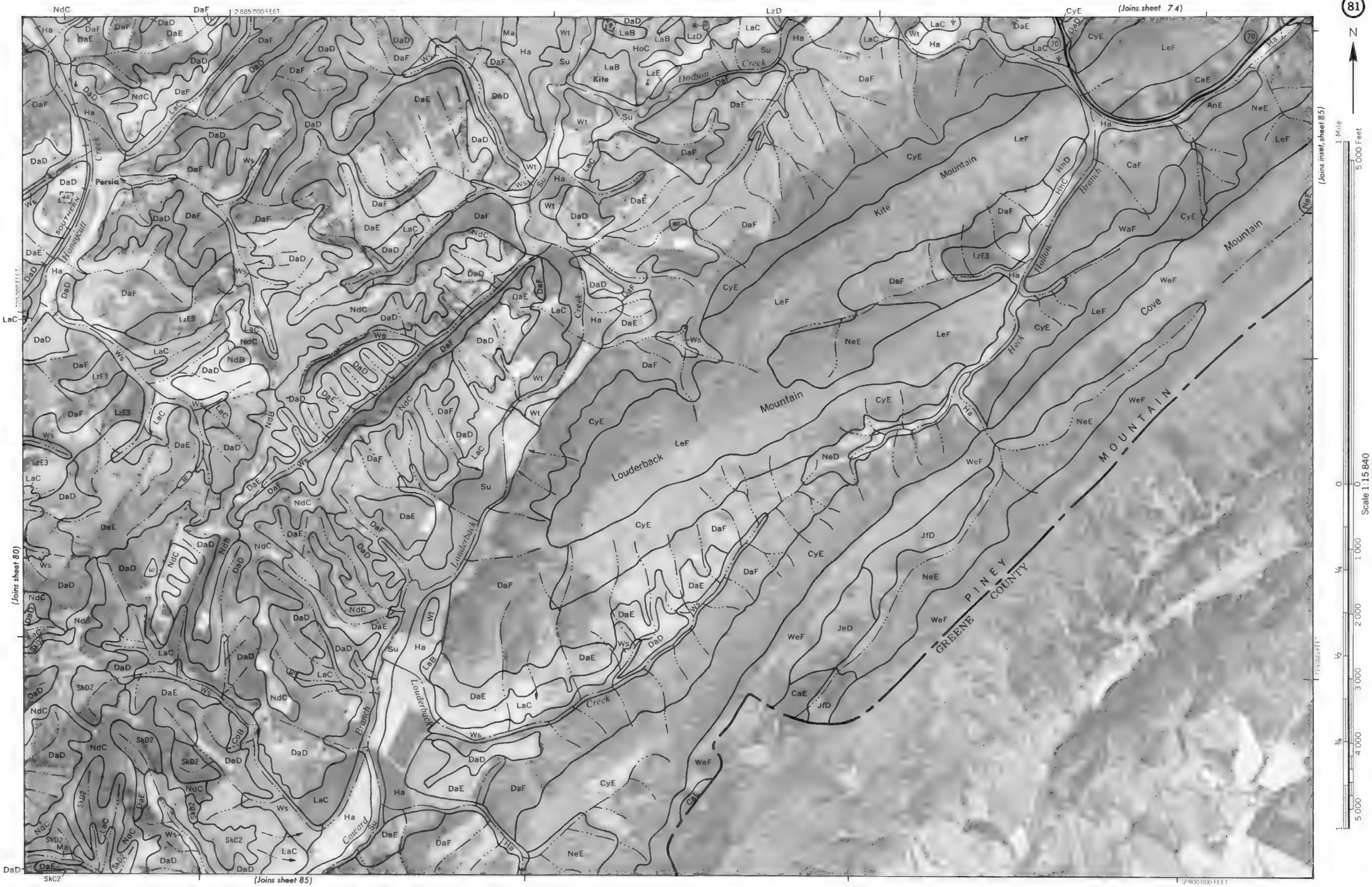
5 000 Feet

Scale 1:15 840


78
N
(Joins sheet 71)
(Joins sheet 77)
(Joins sheet 79)
(Joins sheet 83)
(Joins lower right)
(Joins inset)
POOR VALLEY CREEK
PROPHET RIDGE
HOLSTON RIVER
HAMBLEN COUNTY
CHEROKEE LAKE
LEE VALLEY
Bingham Branch
Dry
Grassy Valley
1 Mile
5 000 Feet
Scale 1:15 840
2 825 000 FEET
2 840 000 FEET
2 842 000 FEET
710 000 FEET
2000 AND 3000-FOOT GRID TICKS


79
N
(Joins sheet 72)
(Joins sheet 80)
(Joins sheet 83)
(Joins sheet 78)
Saint Clair
Rocky Branch
Robertson
Creek
Grassy Ridge
Valley
Nenny
LEE VALLEY
Beck Pond
1 Mile
5 000 Feet
Scale 1:15 840
2 845 000 FEET
720 000 FEET
2 860 000 FEET


80
N
(Joins sheet 73)
(Joins sheet 79)
(Joins sheet 81)
(Joins sheet 84)
2 865 000 FEET
2 880 000 FEET
Scale 1:15 840
1 Mile
5 000 Feet
Mills Pond
Robertson
Walker
Mooney
Branch
Creek
SOUTHERN


81
N
(Joins sheet 74)
(Joins sheet 80)
(Joins sheet 85)
(Joins inset, sheet 85)
2 885 000 FEET
2 900 000 FEET
Kite Mountain
Louderback Mountain
Cove Mountain
PINEY MOUNTAIN
GREENE COUNTY
Persia
Kite
Dodson Creek
Honeycutt Creek
Louderback Creek
Louderback Branch
Coward Branch
Heck Hollow Branch
SOUTHERN
1 Mile
5 000 Feet
Scale 1:15 840

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 82

82

N

(Joins sheet 77)

2 820 000 FEET

705 000 FEET

CHEROKEE LAKE

CHEROKEE LAKE

HOLSTON RIVER

GRAINGER COUNTY

HAMBLEN COUNTY

CHEROKEE LAKE

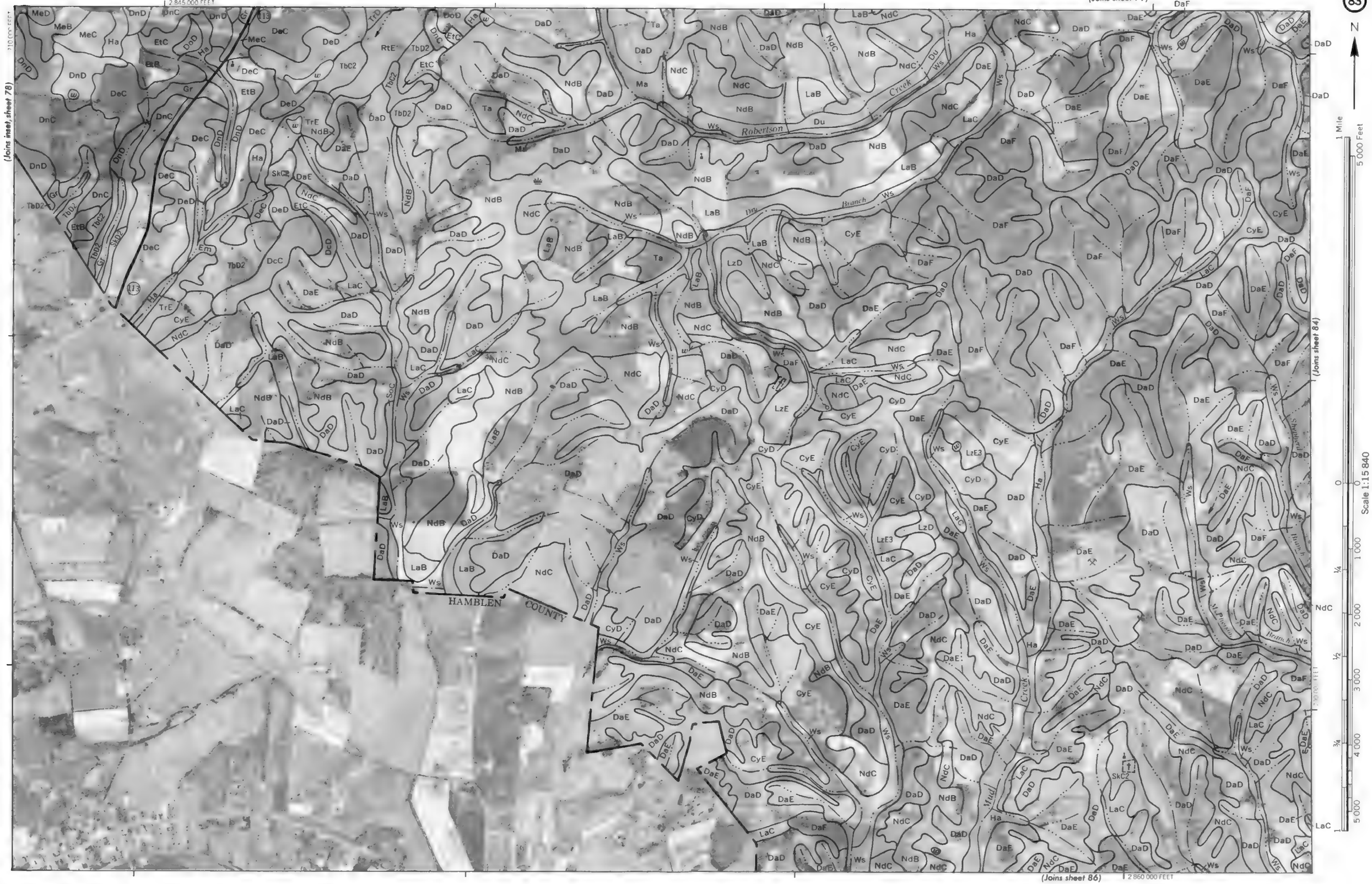
2 805 000 FEET

1 Mile

5 000 Feet

Scale 1:15 840

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 83




N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 80)
(Joins sheet 83)
(Joins sheet 85)
(Joins sheet 87)
2 880 000 FEET
2 865 000 FEET
710 000 FEET
700 000 FEET
White Horn
SOUTHERN
Creek
Branch
Wolf
Arnott
Shelton
Whitehorn
Shepherd Branch
Coward
Sheepbed
Mountain
BAYS MOUNTAINS
Chinquapin
Mountain
PINEY MOUNTAIN
GREENE COUNTY
GREEN COUNTY

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 85

85

N

1 Mile

5 000 Feet

Scale 1:15 840

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

HAWKINS AND HANCOCK COUNTIES, TENNESSEE — SHEET NUMBER 86

(87)

N

2 865 000 FEET

(Joins sheet 84)

(Joins sheet 86)

695 000 FEET

685 000 FEET

2 880 000 FEET

Whitehorn Creek

Sheepbed Creek

Mountain

Pikestaff

Ridge

Leading

GREENE COUNTY

1 Mile

5 000 Feet

Scale 1:15 840